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UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

GRADUATE COLLEGE

BULLETIN 1978-79

UNIVERSITY OF ILLINOIS AT THE MEDICAL CENTER

Academic Calendar
1978-79

Fall Quarter 1978

July 31 (Monday)	Last day for fall quarter admissions applications
September 12-14 (Tuesday-Thursday)	Registration
September 14 (Thursday)	Last day for completion of degree requirements without further registration
September 18 (Monday)	Instruction begins
September 28 (Thursday)	Last day for late registration
October 9 (Monday)	Columbus Day — holiday (no classes)
October 16 (Monday)	Last day for winter quarter admissions applications
October 20 (Friday)	Last day to withdraw from a course, change program, or change registration from audit to credit
November 3 (Friday)	Last day for Graduate College approval of thesis format for fall quarter
November 10 (Friday)	Last day for deposit with Graduate College of approved theses for fall quarter, and for addition of names to fall quarter graduation list
November 23-24 (Thursday-Friday)	Thanksgiving holiday (no classes)
November 27-December 1 (Monday-Friday)	Examination period
December 2 (Saturday)	Quarter ends; degrees conferred

Winter Quarter 1979

December 12-13 (Tuesday-Wednesday)	Registration for winter quarter
December 29 (Friday)	Last day for completion of degree requirements without further registration
January 2 (Tuesday)	Instruction begins
January 15 (Monday)	Last day for late registration
January 29 (Monday)	Last day for spring quarter admissions applications
February 9 (Friday)	Last day to withdraw from a course, change program, or change registration from audit to credit
February 16 (Friday)	Last day for Graduate College approval of thesis format for winter quarter
February 19 (Monday)	Presidents' Day — holiday (no classes)
February 23 (Friday)	Last day for deposit with Graduate College of approved theses for winter quarter, and for addition of names to winter quarter graduation list
March 12-16 (Monday-Friday)	Examination period
March 17 (Saturday)	Quarter ends; degrees conferred

Spring Quarter 1979

March 20-21 (Tuesday-Wednesday)	Registration for spring quarter
March 23 (Friday)	Last day for completion of degree requirements without further registration
March 26 (Monday)	Instruction begins
April 6 (Friday)	Last day for late registration
April 13 (Friday)	Good Friday — holiday (no classes)
April 30 (Monday)	Last day for summer quarter admissions applications
May 4 (Friday)	Last day to withdraw from a course, change program, or change registration from audit to credit

(Continued inside back cover)

GRADUATE COLLEGE

BULLETIN 1978 - 79

UNIVERSITY OF ILLINOIS
AT THE MEDICAL CENTER

The policy of the University of Illinois is to comply fully with applicable federal and state nondiscrimination and equal opportunity laws, orders, and regulations. The University of Illinois will not discriminate in its programs and activities against any person because of race, color, national origin, ancestry, religion, age, sex, handicap, or status as a disabled veteran or veteran of the Vietnam era. This nondiscrimination policy applies to admissions, employment, treatment of individuals, and access to programs.

For additional information on the equal opportunity and affirmative action policies of the Medical Center campus, please contact Carol Cottrell-Mootry, Staff Associate for Equal Opportunity and Affirmative Action, Office of the Chancellor.

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University of Illinois

BOARD OF TRUSTEES

Members Ex Officio

James Thompson, Governor of Illinois	Springfield 62706

Elected Members

1973-79

Ralph C. Hahn	1320 South State Street, Springfield 62704
Park Livingston	202 South Kensington, La Grange 60525
Jane Hayes Rader	Windridge Farm, Route 2, Cobden 62920

1975-81

Robert J. Lenz	P.O. Box 820, Bloomington 61701
Nina Shepherd	256 Scott Lane, Winnetka 60093
Arthur Velasquez	Azteca Corn Products Corp., 4850 South Austin, Stickney 60402

1977-83

William D. Forsyth, Jr.	P.O. Box 2209, 1201 South Fourth Street, Springfield 62703
George W. Howard III	Howard Building, Box U, Mount Vernon 62864
Earl L. Neal	Suite 1525, 111 West Washington Street, Chicago 60602

Officers of the Board

George W. Howard III, President	Mount Vernon
Earl W. Porter, Secretary	Urbana
Robert R. Manchester, Treasurer	Chicago
Ronald W. Brady, Comptroller	Urbana

ADMINISTRATIVE OFFICERS OF THE GRADUATE COLLEGE

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Vice-President for Academic Affairs	Peter E. Yankwich
Vice-President for Administration	Ronald W. Brady
Chancellor of the Medical Center Campus	Joseph S. Begando
Vice-Chancellor for Academic Affairs at the Medical Center	William J. Grove
Dean of the Graduate College at the Medical Center Campus	W. Ann Reynolds
Associate Dean of the Graduate College at the Medical Center Campus	John P. Marbarger
Assistant Dean of the Graduate College at the Medical Center Campus	Howard G. Sachs

Fields of Instruction

Anatomy: M.S., Ph.D.
George D. Pappas, Head

Bioengineering: Ph.D. — Intercampus
Irving F. Miller, Program Director

Biological Chemistry: M.S., Ph.D.
Terrell C. Myers, Acting Head

Biology/Experimental Pathology:
Ph.D. — Intercampus
John A. Nicolette, Chairperson
(1978-79)

Graduate College: Electives
Howard G. Sachs, Assistant Dean

Health Professions Education: M.H.P.Ed.
Phillip M. Forman, Head

Histology: M.S.
Dale R. Eisenmann, Head

Medicinal Chemistry: M.S., Ph.D.
James E. Gearien, Head

Microbiology: M.S., Ph.D.
Sheldon Dray, Head

Nursing Sciences: M.S., Ph.D.
Helen K. Grace, Head

Oral and Maxillofacial Surgery: M.S.
Daniel M. Laskin, Head

Oral Pathology: M.S.
John P. Waterhouse, Head

Orthodontics: M.S.
John F. Cleall, Head

Orthopedic Surgery: M.S.
Robert D. Ray, Head

Pathology: M.S., Ph.D.
Samuel T. Nerenberg, Head

Pediatric Dentistry: M.S.
Allen W. Anderson, Head

Pharmacognosy/Pharmacology:
M.S., Ph.D.
Norman F. Farnsworth, Head

Pharmacology: M.S., Ph.D.
Edmund G. Anderson, Head

Pharmacy: M.S., Ph.D.
Martin I. Blake, Head

Physiology: M.S., Ph.D.
Roderich W. Walter, Head

Public Health Sciences: M.S., Ph.D.
Viron Diefenbach, Acting Head

Radiology: M.S.
Vlastimil Capek, Head

Surgery: M.S.
Lloyd M. Nyhus, Head

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I The University and the Graduate College

I-1. The University of Illinois was founded in 1867 and during the ensuing century has become one of the great universities of the world. Its original campus is located at Urbana-Champaign; over the years two campuses have developed in Chicago: at the Medical Center and at Chicago Circle. Graduate courses are offered at both Chicago campuses under their respective graduate colleges and their proximate locations permit concurrent study. The Graduate College at the Medical Center offers more courses and degree programs than comparable colleges on other basic health sciences campuses; more than 2,500 graduate degrees have been awarded since graduate work at the Chicago Professional Colleges was first initiated in 1924.

I-1.1. The Medical Center campus includes the Colleges of Dentistry, Medicine, Nursing, and Pharmacy, the School of Public Health, and the Graduate College. It is located about three miles west of the Loop and is conveniently reached by bus or elevated train. The Graduate College offices are at 808 South Wood Street; the mailing address is:

The Graduate College
University of Illinois at the Medical Center
P.O. Box 6998
Chicago, Illinois 60680
Telephone: (312) 996-4995

Prospective graduate students interested in areas other than basic health sciences should write to either:

The Graduate College
University of Illinois at Urbana-Champaign
330 Administration Building
Urbana, Illinois 61801
Telephone: (217) 333-0035

or

The Graduate College
University of Illinois at Chicago Circle
P.O. Box 4348
Chicago, Illinois 60680
Telephone: (312) 996-3320

I-2. The encouragement of advanced intellectual achievement in the form of productive scholarship and research is the principal objective of graduate education. Graduate training is not a matter of completing a specific number of advanced courses, but rather emphasizes executing an original laboratory or scholarly investigation. A major requirement for both the M.S. and Ph.D. degrees is a thesis based on a research problem which demonstrates the student's mastery of the field and ability as an independent and scholarly investigator.

I-2.1. High standards for admission of students are maintained and careful selection of faculty members insures that qualified advisers will be available to graduate students. Laboratory, clinical, and library facilities are outstanding.

I-3. Graduate study at the Medical Center campus of the University of Illinois is designed for highly motivated students who desire to pursue advanced work in the basic sciences. Graduates of liberal arts colleges with majors in biology, chemistry, engineering, or physics are considered for admission. A professional college degree in dentistry, medicine, nursing, or pharmacy is required for advanced work in some areas; consult the Departments section for specific requirements for each area.

I-3.1. Graduate programs lead to M.S. and Ph.D. degrees in such fields as anatomy, bioengineering, biological chemistry, biology and experimental pathology, medicinal chemistry, microbiology, nursing sciences, pathology, pharmacognosy, pharmacology, pharmacy, physiology, and public health sciences.* M.S. degrees, only, are offered in certain applied science areas upon completion of formal course work and a thesis based on research. A Master of Health Professions Education is offered to persons wishing to pursue advanced study in that area.

These curricula are suitable for students planning careers in teaching and research in academic, industrial, and governmental institutions.

II Admission

II-1. Early Application. Because considerable time is needed to process and evaluate credentials, prospective students should apply for admission as early as possible, up to one year before the beginning of the term in which they expect to enroll. Since the number applying greatly exceeds the number of students who can be accepted, admission is competitive and qualified applicants may be denied admission. Application forms may be obtained from the Office of Admissions and Records (see section II-5.2.), from the departments, or from the Graduate College.

II-2. Requirements. To be considered for admission to the Graduate College an applicant must be:

(a) A graduate of an institution awarding a baccalaureate degree comparable to that granted by the University of Illinois.

(b) Adequately prepared for advanced study as demonstrated in the previous program of study and scholastic record.

(c) Recommended for admission by the department of proposed study and by the dean of the Graduate College.

II-2.1. Prerequisites for advanced work in particular fields are listed in the departmental sections of this bulletin and more detailed information on courses and prerequisites may be obtained by writing directly to individual departments. Departmental requirements, in addition to those of the Graduate College (e.g., special prerequisites for admission, foreign language), are administered at the departmental level.

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* Pending approval of Ph.D. program.

II-3. Usually applicants are college graduates with majors in an appropriate science (e.g., biology, chemistry, physics), engineering, mathematics, nursing, or other suitable background for advanced study. For some programs a B.S. degree in nursing or pharmacy or a D.D.S. or M.D. degree may be required.

II-4. Minority Group Applicants. Special consideration is given to applications from promising individuals of minority backgrounds.

II-5. Submission of Applications. New applicants and prospective students who have previously applied for admission to the Graduate College should complete and forward an application for admission and the supplemental data required for admission. Action cannot be taken until all admission data are on hand. Applicants should present:

(a) College-level courses in biology, chemistry, mathematics, and physics.
(b) A bachelor's, master's, or professional degree (M.D., D.D.S., or D.V.M.).
(c) Three letters of recommendation from college instructors.
(d) TOEFL (Test of English as a Foreign Language) examination* results (foreign students only).
(e) Graduate Record Examinations* scores: aptitude test (verbal and quantitative). See section II-5.1.
(f) A brief statement of scientific and professional interests and objectives.
(g) A $20 nonrefundable application fee.

II-5.1. Graduate Record Examinations (GRE). Since the number of students who can be accommodated is limited, and only the most qualified are admitted, applicants should be aware that GRE scores may provide supplementary evidence of promise for graduate work. The verbal and quantitative portions of the GRE are integral parts of the admissions procedure, except for dental and medical students, or holders of dental or medical doctorates who are seeking only the M.S. degree, and who are not graduates of foreign schools. See section II-7. Scores on the advanced test of the GRE in biology, chemistry, engineering, mathematics, or physics, may be required for consideration by some departments. Consult the departmental entry in this bulletin, or contact the department directly for information on this point.

GRE scores must be submitted as part of applications for Graduate College fellowships.

II-5.2. Application forms, transcripts, letters of recommendation, and other correspondence should be addressed to:

Office of Admissions and Records
University of Illinois at the Medical Center
P.O. Box 6998
Chicago, Illinois 60680

II-6. Foreign Applicants. Foreign applicants for graduate study should enclose with their initial inquiry for admission copies of their complete academic records which have been officially certified by the educational institutions previously attended. These official records should include a list of all final degrees, diplomas, or certificates awarded. An authenticated English translation must accompany all documents that are in a language other than English.

II-6.1. Foreign applicants must also provide the following information: full legal name; address to which reply should be mailed; place and date of birth; name of the country of which now a citizen; the subject in which specialization is desired; native language; amount in United States dollars available for support, the source of income, and the length of time this support is guaranteed; a complete chronological listing of all elementary and secondary schools and colleges attended, with the exact dates of attendance, and diplomas, certificates, or degrees received; if not attending school, occupation since leaving school; and the date of planned entry to the Graduate College.

Accurate information on a foreign student's means of financial support during the period of study is required before the Office of International Personnel can issue the I-20 form which will enable the student to apply for a student (F-1) visa from the Immigration and Naturalization Service.

II-6.2. Prior to consideration for admission, foreign applicants whose native language is other than English must pass TOEFL (Test of English as a Foreign Language), unless a degree has been received from an accredited college or university in the United States, the United Kingdom, Canada (except Quebec), Australia, or New Zealand. The examination is given at various times of the year in many centers throughout the world. Upon receipt of satisfactory English test results and the completed application data, documents admitting the student to the Graduate College, including an appropriate certificate from the Office of International Personnel to apply for a visa to enter the United States, can be issued.

II-6.3. According to Immigration and Naturalization

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* For these examinations, apply to: Educational Testing Service, Princeton, New Jersey 08540.

Service regulations, a foreign person on an F-1 (Student) Visa must carry a full-time course load. Students registered in -499 Thesis Research for zero credit who are on campus devoting full time to their research or thesis preparation are considered to fulfill this requirement.

II-6.4. Students on an F-1 Visa who wish to transfer to the Graduate College at the Medical Center must secure permission from the Immigration and Naturalization Service *before* they can be considered for admission. The procedures for this process are handled through the Office of International Personnel, which is notified by the department in which the student plans to study.

II-7. Graduates of Foreign Schools. All graduates of foreign schools must present scores on the Graduate Record Examinations (verbal and quantitative) at or above the level of prevailing standards.

II-8. Health. Each applicant to the University of Illinois at the Medical Center is required to submit, as part of the application, evidence of having received a recent physical examination by the applicant's own physician.

A checkoff form for use of the examining physician is sent by the Office of Admissions and Records to all applicants for admission. A copy of the completed form will be sent to Health Service for those applicants who are admitted.

II-8.1. It is strongly urged that each applicant, after acceptance, visit a physician and dentist, attending to such items as dental repairs and fitting for glasses. After instruction has started it will be difficult to have these done without loss of time from classes.

III Rules and Regulations

III-1. Registration. Graduate students must register at the beginning of each quarter. Initial registration is permitted only after official acceptance of the student by letter from the Graduate College Office.

III-1.1. Registration forms and instructions are available at the Graduate College Office. Following consultation in the department the student is assigned a major adviser with whom a program of study and research is discussed. After obtaining the signature of the major adviser, the student obtains the signature of the instructor for each course on the registration form. The form is then submitted to the Graduate College Office for approval. Admission to graduate courses is granted only to persons who have the requisite undergraduate work. Registration, including the payment of fees, must be completed during the period scheduled for that purpose. If a student is unable to handle registration or preregistration procedures in person, the adviser or some other responsible individual may act instead.

III-1.2. Preregistration. There is a preregistration period scheduled by the Office of Admissions and Records during which students are expected to fill out a green registration slip and a yellow program card. The registration slip must have the approval of the instructor(s) and major adviser. A change of program before final registration must be made on the proper form, which can be obtained in the Graduate College Office, and cannot be completed until the registration period (see calendar).

III-2. Retroactive Registration. No form of retroactive registration is permitted.

III-3. Change of Program and Withdrawal from Courses. The graduate student is expected to plan work carefully with the adviser. A change of program is permitted, within the time allotted for this purpose as indicated in the calendar, if approved by the major adviser, the instructors involved, and the dean of the Graduate College. If a student wishes to drop a course (withdraw) or to add other work, an official change slip must first be secured from the Graduate College Office. No grade is given in case of official withdrawal. A student who ceases to attend class without official approval receives a grade of E (failure). The last dates to withdraw from a course, as given in the Academic Calendar, are strictly observed. Exceptions to permit later withdrawal without penalty are made only for urgent reasons such as the student's ill health or extraordinary circumstances.

III-3.1. Change in Major Field of Study. A student who wishes to transfer from one department to another must secure the written approval of the two departments involved and the dean of the Graduate College.

III-3.2. Withdrawal from the Graduate College. When students discontinue course work and leave the campus, even for a single quarter, they should obtain approvals by means of a clearance slip. Exceptions to this procedure for the summer quarter only are made for M.S.N. students. This enables the University officially to deal with the students' previous area of business, loans, scholarships, library transactions, student affairs activities, laboratory loans, housing bills, and grade completion. Without the clearance procedure these objectives may be defeated. The students' goals may change, they may go to another school, their health may be impaired, or their progress in the Graduate College interrupted.

Students who leave without official clearance will have to reapply through the usual competitive admissions procedure in order to resume their graduate studies.

Students who have officially withdrawn may resume graduate studies by filing a Readmission Application form with the recommendation of the department and approval by the dean.

Students returning after an absence of one quarter or more should inform the Office of the Dean and then the Office of Admissions and Records at least by the fifth week of the preceding quarter to allow for an orderly production of the proper admissions material and allow for the assessing of fees.

III-4. Status of Students.

(a) *Degree Candidates* are students accepted under prevailing standards of admission and registered in a master's or doctoral program of courses. The term *candidate* is also used more specifically to describe a doctoral student in the process of meeting final requirements.

(b) *Nondegree (Special) Students* are enrolled for the purpose of taking specific courses only. Such students are admitted under the same prevailing standards as degree candidates and may obtain transcript credit for passing grades.

(c) *Auditors (Course Visitors).* Graduate students, or persons not registered in the University of Illinois, are permitted to attend classes (other than laboratory courses) as auditors, provided a visitor's permit bearing the approval of the instructor and the dean of the Graduate College is filed with the Office of Admissions and Records. Permits are available from the Graduate College Office; fee, $15 per course; no credit or transcript will be issued. Auditors need not apply for admission to the Graduate College. The auditor's fee is not charged auditors who are enrolled as full-time students on campus. A graduate student should not enter on the registration form any courses which the student plans to attend as an auditor.

An *auditor* is only a listener in the classes attended, not a participant in any part of the exercises. A student who has attended a class as an auditor will NOT be allowed an examination for credit in the course. Names of auditors do not appear on course rosters. No instructor is allowed to admit any such listeners to any classes except on presentation of a written certificate showing that the student has complied with the foregoing conditions. The auditor's fee is refunded if the auditor withdraws during the first ten days of instruction. No refund is given for a withdrawal after this date.

Persons in the employ of the University may audit without fee on the recommendation of the head of the department in which the employee works, with the consent of the instructor of the course, and with the approval of the dean of the Graduate College and the Personnel Services Office.

If the auditor desires to change registration from audit to credit, this may be done with the approval of (or admission by) the Graduate College before the term is half finished (see calendar) and upon the payment of appropriate fees.

(d) *Probationary.* (1) Students with some deficiency in academic preparation or level of scholastic achievement are occasionally given conditional admission. Such students may be given degree status upon completion of the equivalent of a full quarter (16 quarter hours) of work in formal courses with grades of A or B (a grade of C or below during this period disallows further registration) and/or removal of the deficiency identified by the department at the time of conditional admission.

(2) Students who fail to maintain scholastic standards as described in III-10.

(e) *Part-Time and Full-Time Students.* Students registered in degree programs for less than 12 quarter hours are called part-time; those registered for 12 to 16 quarter hours, full-time. Although students engaged in -499 Thesis Research for zero credit are not in full-time status, they may actually be engaged on campus in research or thesis preparation for a full schedule of hours.

III-5. Credit for Courses. Courses numbered from 300 to 399 are open to advanced undergraduate and graduate students, and those numbered 400 and above are designed for graduate students. Courses numbered below 300 do not carry graduate credit. Graduate credit is measured in terms of quarter hours (qh); the maximum for a full-time graduate student is usually 16 quarter hours each quarter.

III-6. Transfer of Credit. A graduate student who has completed graduate courses elsewhere may petition for a limited transfer of credit. Such a transfer must have the recommendation of the student's adviser and the head of the department in which the student is pursuing the graduate program, and the approval of the dean. In such instances the department must be satisfied that the work is equivalent to the level of graduate courses offered by the University of Illinois and that the formal program of the student at this institution will be sufficient to warrant the awarding of the degree by the University of Illinois. The petition is not acted upon finally until the residence requirement is fulfilled. See sections V-3 and VI-5.

III-6.1. Students with a Master of Science Degree from Outside the Medical Center Campus. Not more than the minimum number of hours (48) required for the master's degree may be applied to the total required for the doctorate (144 quarter hours). The remaining 96 hours of graduate study are to consist of 16 hours of 400-level formal courses and 80 hours of seminars, electives, and research.

III-6.2. Students Receiving a Master of Science Degree at the Medical Center Campus. Students who are to receive a master of science degree from a department of the Graduate College and are approved by the same department for continuation as Ph.D. students will have 48 quarter hours of their graduate study allotted to the M.S. degree. Any remaining hours of graduate study can be allocated to the 96 additional hours required for the Ph.D. degree. The latter requirement consists of 16 hours of 400-level formal courses and 80 hours of seminars, electives, and research.

III-7. Course Codes. With a few exceptions certain course numbers always indicate special types of courses: 440 to 449, Special Topics; 491, 492, 494, 495, Seminar; 493, Research; and 499, Thesis Research (used for zero-credit registration). Courses based primarily on lectures, conferences, and laboratories (i.e., excluding seminar and research courses) are called *formal.* Courses for the various departments may be distinguished by code letters preceding course numbers as follows:

AN	(Anatomy)
BE	(Bioengineering)
BC	(Biological Chemistry)
BP	(Biology/Experimental Pathology)
GC	(Graduate College)
ED	(Health Professions Education)
DH	(Histology)
MC	(Medicinal Chemistry)
MI	(Microbiology)
N-	(Nursing Sciences)
OS	(Oral and Maxillofacial Surgery)
OP	(Oral Pathology)
RD	(Orthodontics)
RS	(Orthopedic Surgery)
PA	(Pathology)
PE	(Pedodontics)
PP	(Pharmacognosy/Pharmacology)
PL	(Pharmacology)
PM	(Pharmacy)
PY	(Physiology)
H-	(Public Health Sciences)
RA	(Radiology)
SU	(Surgery)

III-8. Graduate Study by Academic or Nonacademic Members of the Staff. Employees whose department head or director requests that they take a course to improve their potential for service to the University may register for those courses as auditors without formal credit toward a degree. See section III-4.(c). Nonacademic employees may undertake graduate courses for credit provided Graduate College admission requirements are met. It is necessary to have approval of the employing department and of the Personnel Services Office on a form available from the Training and Staff Development Section, Room 163, DMP Building. Assistants, research assistants, residents, interns, and others on the University staff who undertake graduate study may not be able to carry so full a course program as those who devote full time to their graduate work. Where the number of hours of employment makes it difficult for the student to do justice to a full course load of 16 quarter hours per quarter, it may be better for the student to register for a lighter course schedule. (See section III-8.1.) Such arrangements are subject to departmental approval.

III-8.1. Registration Loads and Terms of Employment. Assistants are permitted to register for up to 16 quarter hours per quarter. However, it is advisable for students, in consultation with their departments, to carry course loads consonant with the demands of assisting, and which are not so heavy as to prove detrimental. Suggested schedules: one-quarter time employment or less, 16 quarter hours; half-time, 12 to 16 quarter hours; two-thirds time, 9 to 13 quarter hours; three-quarters time, 8 to 11 quarter hours; full time, 4 to 6 quarter hours. Nonacademic employees pursuing graduate study should be similarly guided by these suggested schedules. However, under the Employee Educational Policy provisions, tuition waiver benefits are limited to one or two courses, depending upon percentage of time worked by the employee. See section VII-3.1(f).

III-8.2. Restriction on Graduate Work for Academic Staff Members. No person is admitted to candidacy for an advanced degree on a campus of the University who holds an appointment as professor, associate professor, or assistant professor in any department or division of that campus of the University. Any person engaged in graduate study who accepts an appointment with the rank of assistant professor or higher at a campus of the University will be dropped as a degree candidate on that campus. In the case of intercampus graduate programs, no one will be admitted to candidacy for an advanced degree who holds the appointments noted in any one of the cooperating campuses of the University.

III-9. Time for Completion of Degrees. A full-time graduate student is expected to complete all work for the M.S. degree within one or, as some curricula may warrant, two years; for the Ph.D. degree, within four years. Programs should be carefully planned to this end. A part-time student may take longer, except as restricted by III-9.1.

III-9.1. A candidate for the M.S. degree must complete all requirements for the degree within five calendar years after first registration in the Graduate College; a candidate for the Ph.D. degree must complete all requirements within seven calendar years after first registration in the Graduate College, except as noted in III-9.2.

III-9.2. A candidate for the Ph.D. degree who has received a master's degree elsewhere must complete all requirements for the degree within five calendar years after first registration in the Graduate College. A student whose program of study is significantly interrupted after receiving a master's degree from the University of Illinois and who later returns to work for the doctorate will have five calendar years from the date of return to complete degree requirements.

III-10. Grades, Probation, and Disqualification for Further Study. Grades are recorded as A, B, C, D, and E. E indicates failure, and D indicates unsatisfactory work. The letter W is used to indicate official withdrawal from a course.

III-10.1. Deferred Grades. The deferred grade (Df) is used to designate a grade deferred temporarily. It may be used in thesis, research, and special problems courses that extend over more than one quarter. At the end of that time, the letter grades (A, B, C, D, and E) must be submitted. Requests to use the Df grade in any other course must be submitted in writing to the dean for approval, who will transmit the request to the Office of Admissions and Records.

III-10.2. Incomplete Grades. The incomplete grade (In) may be assigned to a student who is absent from the final examination or who has not completed work in the course for some justifiable reason. An In grade must be removed by either (1) the end of the student's second quarter in residence subsequent to the one in which it was received; or (2) if the student is no longer in residence, by the end of the first calendar year subsequent to that in which it was received. An In grade not removed by the deadline is automatically revised to a grade of E.

III-10.3. Standards of Performance. A separate grade point average (GPA) will be calculated for formal course work and for research and seminar courses. In this connection, seminar means the departmental seminar or colloquium (courses numbered 491), not a formal course organized on a discussion/seminar basis.

(a) *Graduation.* In order to graduate, the student must have a cumulative grade point average of 3.75 (A = 5.00) or better in each of the GPA systems.

(b) *Probation.* When the cumulative grade point average falls below 3.50 (A = 5.00) in either system, the student will be placed on probationary status. The student is warned that further registration in the Graduate College will be denied if the academic record continues to be unsatisfactory.

(c) *Disqualification for Further Study.* After two consecutive quarters with a cumulative GPA below 3.50 in one of the systems, the student will be dropped from the Graduate College.

III-10.4. Departmental Standards. Departments and programs may require a higher level of performance and may have additional criteria for evaluating a student's progress. It is a departmental responsibility periodically to review the student's progress and research performance. If the student's record is deemed unsatisfactory, a warning will be issued to the student, signed or approved by the department head, with a copy to the Graduate College. If, after at least one quarter, a second review indicates continued unsatisfactory progress and research performance, the student, the department head, and the Graduate College are informed; the student is ineligible for further registration and is so notified by the Graduate College.

III-11. Attendance at Commencement. Candidates for graduate degrees are expected to attend commencement exercises at the end of the spring quarter.

III-12. Advisers. Every graduate student must have a program adviser (a major adviser) assigned following consultation within the department. This adviser, who must be a member of the Graduate College faculty, has a primary duty to assist the student in planning and carrying through a program of graduate work which fits the needs and desires of the student, and at the same time satisfies departmental and Graduate College requirements. The major adviser usually serves as supervisor of the student's research project. If this is not feasible, supervision of the student's research may be delegated to a thesis adviser who need not be a member of the graduate faculty.

III-13. Completion of Degree Requirements. Students finishing their graduate studies, but who have not completed all University requirements for their degree prior to the first day of instruction of a quarter, must enroll and pay the appropriate fees for the quarter.

IV Intercampus and Special Programs

IV-1. CIC Traveling Scholar Program. The University of Illinois is a member of the Committee on Institutional Cooperation (CIC), a voluntary association of Big Ten universities and the University of Chicago, and participates in its Traveling Scholar Program. This enables a doctoral student to spend up to a full academic year studying at another CIC institution to enjoy the advantage of special courses, specialized laboratory equipment, library material or facilities, or the guidance of faculty with unique talents that are not available at the home institution. (The University of Chicago allows up to two academic quarters without requiring registration and payment of regular tuition and fees.)

IV-1.1. Admission to the CIC Program:

(a) The student consults with his or her adviser, who determines the probable value to the student of the off-campus opportunity and that it is not duplicated on campus.

(b) The adviser then consults with the counterpart faculty member at the prospective host institution.

(c) On agreement of the adviser and the host faculty member, the student initiates the form, Application for Admission to the CIC Graduate Exchange Program, obtainable from the Graduate College Office. The student's credentials are then sent to the traveling scholar liaison officers at both institutions.

(d) If both liaison officers approve, the student is notified of acceptance by the dean of the Graduate College, who is the liaison officer for the University of Illinois at the Medical Center.

IV-1.2. The traveling scholar registers, pays fees, and receives credit at the home university; the host institution provides health and medical services as for its own students.

IV-2. Concurrent Registration. Students may register concurrently at the Chicago Circle or Urbana-Champaign campuses of the University of Illinois with the signed approval of the major adviser, the instructor of the course, and the dean of the Graduate College.

IV-3. Courses Taken at Other Institutions. As part of an approved program of the Graduate College of the University of Illinois at the Medical Center, students may register for courses at other institutions than those noted in IV-1 or -2, upon recommendation of the major adviser and the department head, and with approval of the dean of the Graduate College. When courses are completed, the proper credit is accepted and recorded upon the receipt of the transcript.

IV-4. Intercampus Bioengineering. The Ph.D. in bioengineering is a joint interdisciplinary program between the graduate colleges at the Medical Center and Chicago Circle campuses. The program accepts students with backgrounds in either engineering or life sciences including medicine, and is designed so that the student will receive substantial experience in both of these disciplines. See under Bioengineering (Intercampus) in the Departments section. When applying, specify the degree sought as "Ph.D. — Intercampus Bioengineering." Details may be obtained by writing to:

Program Head, Bioengineering
College of Engineering
University of Illinois at Chicago Circle
P.O. Box 4348
Chicago, Illinois 60680

By means of an Intercampus Agreement between the two campuses, students at the Medical Center may matriculate in the M.S. Bioengineering program given at Chicago Circle. Students interested in a master's degree in Bioengineering must file an application for the Intercampus Graduate Program available in the Graduate College and departmental offices.

IV-4.1. Intercampus Biology and Experimental Pathology. The Ph.D. in biology and experimental pathology is a joint interdisciplinary program between the graduate colleges at the Medical Center and Chicago Circle campuses. It is designed to provide well-qualified students with a broad understanding of the life sciences as a whole and with intense training in areas of specialization, including evolutionary and environmental biology, regulatory biology, and experimental pathology. The program is administered by an Intercampus Governing Committee. Applicants for admission may enter through the Graduate College at the Medical Center, or through the Graduate College at Chicago Circle, in accord with admissions standards prevailing at that campus. When applying, specify the degree sought as "Ph.D. — Intercampus Biology and Experimental Pathology." Details may be obtained by writing to the dean of the Graduate College at either campus.

This doctoral program is separate from the pathology major which students enrolled for the Ph.D. in the Department of Pathology may take and which is described under the departmental heading PATHOLOGY.

IV-5. Public Health and Public Health Education. This joint program provides an opportunity for M.S. and Ph.D. degree candidates in the Department of Health and Safety Education at Urbana-Champaign to take part of their course work at the School of Public Health at the Medical Center. The intercampus relationship permits increased emphasis on community aspects of health education as related to both traditional and emerging public health programs.

Students wishing to undertake these studies must file an application for the Intercampus Graduate Program (IGP), available in Graduate College and departmental offices. A document entitled "Procedures for Student Participation in an Intercampus Graduate Program (IGP)" is also available in the Graduate College Office. It provides information relating to application for the program, registration, change of campus by the participant in the program, student records, and transcripts. Details may be obtained by writing to:

Department Head
Department of Health and Safety Education
University of Illinois at Urbana-Champaign
Champaign, Illinois 61820

IV-6. Combined Professional-Graduate Degree **Programs.** Graduate degrees represent tangible evidence of research training and are important symbols for lifetime reference. A combined professional-graduate degree program is available leading to M.D. or D.D.S. and M.S. degrees which may be completed during the four-year period of matriculation in the professional college. Additional advanced credit may also be earned to apply toward the Ph.D. which may be completed after the professional degree is awarded, or before it is awarded, if a year is taken out of professional training and devoted to full-time graduate work.

IV-6.1. Interested medical or dental students are urged to consider the professional-graduate program. Many have found it a rewarding experience and an advantage in consideration of future academic or research positions. Specialty Boards may also give credit toward certification in a professional specialty for graduate-level study, thus reducing the time required for certification as a specialist.

IV-6.2. Because the medical or dental student acquires a broad basic science background in anatomy, biological chemistry, microbiology, pharmacology, physiology, and pathology during the pursuit of formal course work in the professional curriculum, only a minimal addition of formal graduate courses is required. For a master's degree as few as 5 quarter hours of formal course work (usually one or two courses) in the 400 series may be sufficient in any one of the above-mentioned basic science areas and the remaining 43 quarter hours may be in seminars, collateral courses, and research. This means that up to 11 quarter hours in formal collateral courses may be granted for medical or dental courses so approved by the major adviser. This section applies also to applicants who hold the D.D.S. or M.D.

IV-6.3. For the Ph.D. degree, 16 quarter hours of 400-level formal courses are required and the remaining 128 hours may be earned in seminars, electives, and research. A student may pursue a degree in a basic science and develop the research and thesis under an adviser in the clinical departments. The thesis, however, must be basic-science–oriented.

IV-6.4. Professional students are exempt from Graduate College tuition and fees when they are registered in professional degree programs. For students in the College of Medicine, this applies during the fifteen quarters of continuous registration, provided the student has not formally been awarded the Doctor of Medicine degree. If the Doctor of Medicine degree is awarded prior to the completion of fifteen quarters, the student must pay for any additional courses taken after the Doctor of Medicine degree has been granted.

Either six hours per quarter taken simultaneously with a full professional curriculum, or registration for a full program of sixteen quarter hours during a vacation or alternate quarter, is permitted, with approval by the dean of the professional college concerned. By using all opportunities with a full professional curriculum, a student may complete more than 100 quarter hours toward the total of 144 quarter hours required for the Ph.D. degree by the time the professional degree is completed. In such a case, the combined degrees can be obtained within five years. Selected students of high scholastic attainment may be eligible for waivers of tuition in both professional and graduate colleges, and in some instances, fellowships or assistantship stipends may be available as well.

IV-6.5. After preliminary discussions with the department in which graduate studies are contemplated, the professional student should apply for admission to the Graduate College in the usual manner, and submit a program proposal for the Ph.D. degree for the approval of the dean of the Graduate College.

V The Degree of Master of Science

V-1. The master's degree is awarded in recognition of the successful completion of substantial postbaccalaureate study in a chosen field in preparation for scholarly and professional activities. It may be a terminal degree or it may be a course of study and research designed to serve as the foundation for a more advanced scholarly undertaking leading to the Ph.D. degree. The M.S. program also involves research culminating in a satisfactory thesis.

V-2. Study Program — Minimum Requirements for the M.S. Degree.*

Formal Courses	
In 400 series	5 quarter hours
In collateral courses	11 quarter hours
Research, seminars, and electives	32 quarter hours
Total	48 quarter hours

An acceptable thesis

Pass a final oral examination

V-3. Residence. Each candidate for the M.S. degree must spend time in residence defined as study at the Medical Center campus for at least three calendar quarters and at least 24 quarter hours in regularly scheduled courses. See also sections II-6.3 and III-9.

V-4. Thesis. A candidate for a master's degree must submit a thesis on a subject approved by the professor supervising the work. Such approval must be secured and the subject of the thesis filed at the Graduate College Office at the time the final examining committee is proposed.

V-5. Thesis Work in Absentia. A student may be permitted to complete the last 10 quarter hours of work, if devoted to the thesis, away from the campus. In order to do so, the student must have accumulated at least 38 quarter hours in residence, must submit an outline of the proposed investigation approved by the head of the major department, and must provide satisfactory evidence that adequate facilities are available where the proposed work is to be done. If the arrangement is approved by the dean, the student must register, pay tuition and fees, and communicate with the adviser at frequent intervals concerning progress.

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* Public Health Sciences requires 72 quarter hours.

A student who has completed all course requirements may be granted official leave to work on the thesis, but must return in the final quarter, file a Readmission Application, and pay fees; or the student may register for zero credit in -499 (Thesis Research) as may be approved by the adviser.

V-6. Thesis Preparation. A booklet of instructions for the preparation and form of the thesis is available at the Graduate College Office. The thesis may be submitted at any time during the year; however, candidates who expect to receive a degree at a particular time must meet the related deadline (see calendar).

V-7. Final Examination. After the thesis is approved in the Graduate College Office, a committee appointed by the dean examines the thesis and determines by oral examination the candidate's knowledge in the chosen field of study. Degrees are conferred at the end of each quarter, with commencement exercises in the spring quarter. Candidates must be recommended to the dean for the degrees indicated at least three weeks before the date set for the conferral (see calendar).

V-8. Second Master's Degree. A graduate student who holds a master's degree from the University of Illinois or from another accredited institution may wish to become a candidate for a second, different master's degree from the University of Illinois. To do so, the student must satisfactorily complete at least 35 quarter hours of work beyond those submitted in partial fulfillment of the requirement for the first master's degree; 20 of these quarter hours must be in the major field. By petition, up to 10 quarter hours which were completed in partial fulfillment of the requirements of the first master's degree may be accepted as transfer credit.

VI The Degree of Doctor of Philosophy

VI-1. Admission. Students desiring admission to graduate study for the Ph.D. degree may initially enroll with the department of their choice either for the M.S. or for the Ph.D. degree. After completion of the M.S. degree, or satisfactory completion of 48 quarter hours of graduate study, students may be eligible formally to pursue a program toward the Ph.D. degree. Before registration of the student for work toward the degree, a qualifying committee composed of the student's major adviser as chairman and two additional members of the graduate faculty chosen by the major adviser or the department head, will arrange an interview with the student to outline a program of formal courses, seminars, and other requirements in an integrated whole relevant to the objectives of the student and major adviser. The program as outlined shall be recorded in the Graduate College Office and is subject to change upon recommendation of the departmental committee and approval by the dean. A student who petitions to bypass the M.S. degree must have met the departmental requirements and must be in good standing in the Graduate College.

VI-1.1. A student who enrolls directly for the Ph.D. degree arranges with the committee described in VI-1 to prepare a program proposal for the Ph.D. degree. This should be submitted to the Graduate College Office as soon as possible, but must be submitted before registration for the fifth quarter.

VI-1.2. In the case of students who receive the M.S. degree from a department of the Graduate College and later decide to seek the Ph.D., a new application must be completed, an application fee paid, and approvals by the graduate department and the dean must be secured. Procedures for students with or expecting a degree of Master of Science, who wish to continue with doctoral study are given in the *Graduate College Handbook,* section 24.2.

VI-2. Study Program — Minimum Requirements for the Ph.D. Degree

Formal 400 series courses	
In major discipline	10 quarter hours
In collateral area	6 quarter hours
Research, seminars, and electives	128 quarter hours
Total	144 quarter hours

Pass an oral preliminary examination

An acceptable thesis

Pass a final oral examination. See section VI-9.

VI-3. Foreign Language Requirements. The Graduate College does not have a foreign language requirement. When an individual department has such a requirement, however, the student should make appropriate arrangements to satisfy it. Administration of these requirements rests entirely with the departments.

VI-4. Period of Study. Ordinarily it is expected that graduate students holding fellowships or half-time assistantships will carry a full course load each quarter. In this way a student should expect to complete all requirements for the Ph.D. degree within four years. See also section III-9.

VI-5. Residence. Each candidate for the Ph.D. degree must spend time in residence defined by study at the Medical Center campus for at least three consecutive quarters of at least 8 quarter hours per quarter. Not less than 96 quarter hours must be earned at the University of Illinois.

VI-6. Continuous Registration. Candidates for a Ph.D. degree must continue to register each quarter until their dissertations are accepted by the examining committee and deposited with the Graduate College.

VI-6.1. Failure to maintain continuous registration without having been granted official leave of absence is regarded as an abandonment of graduate studies and resignation from the program.

VI-6.2. Candidates off campus who are completing their dissertations in absentia, register for -493 until the minimum credit requirement of 144 quarter hours has been satisfied. If this minimum credit requirement is fulfilled before the dissertation is completed, the candidate in absentia may register in -499 for zero credit.

VI-6.3. When the minimum credit requirement has been met, a candidate in residence may petition the Graduate College for permission to register for zero credit in -499. Candidates will be limited to two quarters of -499.

VI-7. Preliminary Examinations. In order to become candidates for the Ph.D. degree, students must pass a preliminary examination intended to test their knowledge of the major and collateral fields of study. Students are eligible to take the examination when they have (a) satisfactorily completed all of the formal nonresearch courses prescribed by the qualifying committee, and (b) had the adviser inform the dean that they are adequately prepared.

VI-7.1. The examination extends to the student's whole field of study. It is not confined to specific courses taken in this or other universities, but is conducted to determine whether the student has mastered a definite field of knowledge and is able to evaluate its potentialities and opportunities for further advances. This examination is not intended to treat the student's research interests. The committee must be satisfied that the student is able to integrate the field of specialization with larger domains of knowledge and understanding. The examination is oral, but may be preceded by a written component, in accord with departmental policy.

VI-7.2. The student must complete at least two quarters of residence (32 quarter hours) between the preliminary examination and the completion of all requirements for the doctorate.

VI-8. Thesis. The capacity for independent research should be shown by the production of an original thesis on some topic related to the major field of study. The candidate is expected to defend the thesis or dissertation before the members of the faculty, or as many of them as may wish to question the student about it in connection with the final examination or ceremonial seminar. See section VI-9.1. The subject of the thesis should be chosen and the title submitted to the Graduate College Office at the time the final examining committee is proposed.

VI-8.1. Thesis Preparation. See section V-6.

VI-9. Final Examination. At least three weeks before the time the degree is to be conferred, the candidate may take a final examination given by a committee appointed by the dean. This examination deals primarily with the research work of the student, as embodied in the thesis, and is conducted chiefly to determine if the candidate has demonstrated the capacity to conduct original and scholarly investigations in the chosen field.

VI-9.1. The student and department may elect to forego the customary final Ph.D. examination and substitute in its place an open departmental seminar at which one or more candidates will present the results of their investigations. In addition to the members of the thesis committee who attend, faculty members from other departments, graduate students, and other interested parties may attend. A seminar of this type takes the nature of a ceremonial event rather than an examination in the usual sense, although the candidates may expect critical interrogation by members of the audience. Members of the final examination committee who approve the thesis may sign for it before or after the seminar.

VII Tuition and Fees

VII-1. Students registering for graduate work pay fees, which are subject to change without notice, according to the following schedule:

	FULL PROGRAM	
	Range I 12 quarter hours and above	
	Resident	*Non-resident*
Tuition (except those holding exemptions)	$205	$615
Service fee	77	77
Hospital-medical-surgical fee	39	39
Total	$321	$731

	PARTIAL PROGRAMS				
	Range II Above 5 but less than 12 quarter hours		Range III Above 0 through 5 quarter hours		Range IV 0 credit only
	Resident	*Non-resident*	*Resident*	*Non-resident*	*Resident and Non-resident*
Tuition (except those holding exemptions)	($140)	($420)	($75)	($225)	($38)
Service fee	54	54	31	31	15
Hospital-medical-surgical fee	39	39	39	39	39
Total	($233)	($513)	($145)	($295)	($92)

VII-1.1. Special Fees.

Late registration fee. Former students who register after the regular registration days are subject to this fee	$15
Auditor's fee, per course	$15
Special examination fee. This fee is charged for any special examination given in a course which has been failed	$10

Transcript fee. Each student who has paid all other University fees is entitled to receive, without charge, transcripts of record.

VII-1.2. Service Charge for Deferred Fees. Tuition and fees for each quarter may be paid in installments. Students electing this plan are assessed a service charge.

VII-2. Assessments. Tuition and fees are assessed all students, as applicable. The nonresident tuition fee is assessed against those students who are defined as nonresidents of Illinois under *Regulations Governing the Determination of Residency Status for Admission and Assessment of Student Tuition.*

VII-2.1. For fee assessment purposes, a staff appointment must require service for not less than three-fourths of the academic term, defined as the period between the first day of class and the last day of final examinations. Staff tuition and fees privileges do not apply to students employed on an hourly basis in either an academic or nonacademic capacity, or to persons on leave without pay.

VII-2.2. University employees appointed to established civil service positions whose rates of pay are determined by negotiation, prevailing rates, and union affiliation are not considered as paid on an hourly basis and are entitled to the same tuition and fee privileges accorded to other staff members under the regulations.

VII-2.3. Any student who resigns a staff appointment, or whose appointment is cancelled before rendering service for at least nine weeks of the term, becomes subject to the full amount of the appropriate tuition and fees for that term, unless the student withdraws from University classes at the same time the appointment becomes void. Such a student is not assessed tuition and fees for that term if clearance papers are filed within one week after the appointment becomes void.

VII-3. Exemptions. CIC traveling scholars from other CIC institutions pay appropriate tuition and fees at their home institutions; they pay no tuition or fees for their work on this campus. Other students may be exempted from one or more of the usual charges if they qualify under the conditions listed below.

VII-3.1. Tuition Is Waived for:

(a) Holders of tuition waiver scholarships.

(b) All academic employees of the University on appointment for at least 25 percent, but not more than 67 percent, of full-time service.

(c) Holders of graduate tuition and fees waivers awarded by the Graduate College.

(d) University employees registered at the request of their departments in zero-credit courses especially established to improve the work of the employee.

(e) Academic staff members emeriti.

(f) Nonacademic employees of the University in status appointments, or in appointments designed to qualify for status in an established class. Tuition waivers are limited to six credit hours or two courses in a quarter if the employee is on a full-time appointment; four quarter hours if on an appointment three-quarter time or more, but less than full time; and three quarter hours if on an appointment half time or more, but less than three-quarter time. The Employee Educational Policy also provides for waiver of the audit fee on the same basis in cases where nonacademic employees are auditing graduate courses.

(g) Dental and medical residents in the University of Illinois Hospital.

(h) Full-time dental, medical, nursing, pharmacy, and public health students registered dually for part-time graduate study.

VII-3.2. Service Fee Is Waived for:

(a) All those exempt from tuition under VII-3.1 except (a) and (f).

(b) Students registered in absentia.

VII-3.3. Hospital-Medical-Surgical Fee Waivers. The entire hospital-medical-surgical (HMS) fee is waived for:

(a) Persons registered for doctoral thesis in absentia.

(b) All students presenting evidence of equivalent insurance coverage are exempted from the student health insurance portion of the hospital-medical-surgical fee, provided they receive approval of a petition presented to the University Insurance Office not later than the final day established for refund of tuition and fees. See section VII-4.b-1.

(c) University employees who are eligible for the mandatory State of Illinois Employees Insurance Program.

VII-3.4. Summer Session Tuition and Fees Are Waived as Follows: Students holding academic appointments at the close of the final term of an academic year either as employees or fellows, and for whom tuition and/or fees have been provided through waiver or through cash payment by an outside agency, are entitled to a waiver of the same kinds of tuition and fees for the summer session immediately following, provided they hold no appointments during that summer session.

VII-4. Refunds

(a) *Cancellation of Registration.* A continuing student who pays tuition and fees for any term and who subsequently cancels registration prior to the first day of classes of that term shall be refunded the full amount of payment, including the usually nonrefundable charge.

(b) *Withdrawal.* A student subject to tuition and/or fees who files clearance for withdrawal from the University during any term for reasons other than military, receives refunds as follows:

(1) During the first ten days in the quarter, refund is made of the full amount of the tuition and fees assessed except for a nonrefundable charge.

(2) After the first ten days no refund is made.

VIII Financial Assistance

VIII-1. Various types of financial assistance are available to promising graduate students. Students in doctoral and some master's programs are eligible on a competitive basis for stipends (assistantships, fellowships) ranging from $1,700 to $5,500 per year in addition to waivers of, or exemptions from, tuition and most fees. Graduate students who hold fellowships, traineeships, or tuition waivers must carry full-time course loads; excepted are those registered in -499 Thesis Research for zero credit who are on campus devoting full time to their research or thesis preparation. See section III-4(e).

VIII-1.1. The principal kinds of awards are: teaching assistantships, research assistantships, and a variety of fellowships (Graduate College, industrial, endowed, and federally sponsored). Details and conditions of appointment may be obtained from the major adviser and from the *Graduate College Handbook*. Fellowships are income tax free.

VIII-1.2. Specific financial arrangements are usually made directly with the department, where funds are available, subject to the approval of the Graduate College.

VIII-2. Loans. Loan funds have been established for the benefit of worthy students who need financial assistance. The University of Illinois participates in the Student Loan Program under the National Direct Education Act. Financial aid information and application forms are available by writing or calling:

Financial Aid Section
Office of Student Affairs
University of Illinois at the Medical Center
P.O. Box 6998
Chicago, Illinois 60680
Telephone: (312) 996-4940

Grants, student loans, and the College Work-Study Program are administered by the Office of Student Affairs. Awards are based upon demonstrated financial need rather than academic performance or test scores. Applicants are encouraged to submit financial aid forms early, although no aid decision will be made until admission is approved.

VIII-2.1. Illinois Guaranteed Loan. Federal legislation has authorized up to $5,000 per year under this program. The loan is available to full- and half-time students through participating banks and other lenders. Students whose adjusted family income is under $25,000 per year automatically qualify for the Federal interest benefits on the loan, meaning that the Federal Government will pay the 7 percent interest while the student is enrolled in school. Students whose adjusted family income is greater than $25,000 may still qualify for the Federal interest benefits if they demonstrate need for the loan. Applicants in this latter category must submit a Financial Aid Form in addition to the Guaranteed Loan application to the Office of Student Affairs for a determination of their eligibility for interest benefits. Students who do not qualify for the Federal interest benefits can still take out a loan but must pay the 7 percent interest from the time the loan is disbursed. Repayment begins nine months after graduation or the termination of studies. Repayment is not normally deferred for residency or other advanced professional training, but is deferred if the student is enrolled at least half-time in a curriculum leading to another degree. Individual lenders do have some flexibility regarding monthly repayment procedures, but all loans must be repaid within 10 years from the start of repayment.

VIII-3. Illinois Veterans Scholarship. Acts of the General Assembly of Illinois provide scholarships for veterans of the armed forces. These scholarships exempt the holders from tuition only. Applicants must have:

(a) been residents of Illinois at the time of induction into the armed service;

(b) served one year on active duty;

(c) been honorably discharged;

(d) returned to Illinois within six months of discharge.

For detailed information and applications, contact: Financial Aid Section. See address in section VIII-2.

VIII-4. Illinois General Assembly Scholarship. Each member of the Illinois General Assembly may select one student from his district each year to receive a full-tuition award at the University. Make application in writing to the four legislators from your district. The legislators establish their own criteria for this award. In most cases it is given for a period of one year, but it can be received for a shorter or longer time span. Directory available at the Office of Student Affairs.

IX Facilities and Services

IX-1. The Research Resources Center, an arm of the Graduate College, supports research and graduate education. It has seven sections:

(a) **The Biologic Resources Laboratory** is one of the largest and best-equipped animal research facilities in the nation. The laboratory has fifty-two small animal and thirty large animal rooms, as well as diagnostic and therapeutic x-ray and whole body cobalt irradiation rooms. The modern surgical facility can accommodate fifteen operations simultaneously.

(b) **The Electron Microscope Facility** contains seven electron microscopes and maintains educational and service programs which are available to investigators at the Medical Center.

(c) **The Bioinstrumentation Facility** provides electronic instrument design, construction, and service in addition to maintenance and repair activities for electronic equipment at the Medical Center.

(d) **The Environmental Stress Facility** consists of altitude chambers and rooms with a wide variety of temperature, humidity, and pressure control.

(e) **The Nuclear Magnetic Resonance Facility** maintains a computerized high field (90 MHz) high resolution NMR spectrometer and ancillary equipment for the purpose of determining molecular structures and molecular interactions in materials of biomedical importance.

(f) **The Instrument Shop Facility** maintains equipment for construction of special apparatus, primarily for use in research, particularly if such equipment is not available on the commercial market.

(g) **The Biostatistics Facility** provides assistance to faculty and students regarding experimental design, statistical testing and modeling, data interpretation, and guidance in computer analysis of numerical data.

(h) **The Scientific Computer Facility** offers services which include: on-line analog-to-digital conversion and computation; on-line monitoring and control of biomedical parameters; mathematical modeling of biomedical phenomena; graphics and plotting; and biostatistical consulting.

IX-2. The Pharmacognosy and Horticulture Field Station, located in suburban Lisle, provides a unique opportunity for research on medicinal plants.

IX-3. The Library of the Health Sciences serves all the colleges and schools of the University of Illinois at the Medical Center, as well as the University Hospital and affiliated institutions in Chicago, Peoria, Rockford, and Urbana. Its collection is a comprehensive one of materials in all the fields of interest in the Medical Center. Over 4,000 current periodicals are received and more than 350,000 books, bound periodicals, and multimedia items are available. The library provides access to the MEDLINE, ERIC, Psychological Abstracts, BIOSIS, CAIN, NTIS, INSPEC, Chemical Abstracts Condensates, and INFORM data files. In addition the library is part of the MEDLINE network which provides access to the TOXLINE and CANCERLINE data bases. All of these are online files for searching the international health science literature and are available to users at a nominal cost. The library's facilities are available for reference use and a professional staff of thirty-six is on hand to assist. Most library materials circulate; a photocopy service, both mediated and self-service, is available for a small fee.

IX-3.1. The Library of the Health Sciences is one of the designated resource libraries under the program of the Midwest Regional Medical Library. A monthly newsletter is published containing a list of current acquisitions as well as an annual union list of serials, giving library holdings and locations for all serials. A free Library Guide is available which contains information about services as well as library regulations and policies.

IX-3.2. The library collections of the University of Illinois at Chicago Circle are available and easily accessible to the Medical Center, as well as those of other libraries and institutions in the Chicago area. Entry to many other libraries can be obtained when the materials are needed for use by applying for an INFO-PASS at the Reference Desk in the library.

IX-4. Nuclear Magnetic Resonance and Mass Spectrographic Laboratories are campus resources available to Graduate College faculty and students.

IX-4.1. Nuclear Magnetic Resonance Laboratory. The Nuclear Magnetic Resonance Laboratory is expected to be fully operational by fall 1978 and will include four spectrometers: 1) a Bruker CXP-180, fully computer-controlled, for high resolution and high power study of matter in all states of aggregation; 2) a Bruker WH360, computer-controlled, a high resolution instrument only for CW studies; 3) a Varian DP100 for routine wide line and high resolution proton fluorescein, carbon 13, and deuterium studies; and 4) a spectrometer for general purpose NMR studies.

IX-4.2. Mass Spectrograph Laboratory. This facility will be operational by fall 1978. It will include a Varian MAT 112 gas chromatograph/mass spectrometer with computer control and data analysis. This high resolution instrument will be particularly useful to researchers who are interested in determining the structure of unknown substances of biological significance.

IX-5. Housing. The University offers comfortable and convenient living quarters on the campus at reasonable rates in its residence halls and its Staff Apartment Building.

IX-5.1. The Staff Apartment Building has 145 units. Priority in their assignment is given to faculty, nonacademic staff, residents, and interns who are employed by the University at least on a half-time basis. Married students, graduate students, and others are also eligible on a space-available basis. If a married student's spouse is employed by the University at least on a half-time basis, the couple is eligible for employee priority on the waiting list.

IX-5.2. The Student Residence Hall and Women's Residence Hall jointly accommodate 589 students, primarily in double study-bedrooms. Included in the contract for the academic year are 14 meals per week to be eaten Sunday through Saturday. The residence halls are interconnected and join the Chicago Illini Union, forming an integrated, three-building service complex, which provides a wide range of facilities, services, and programs to the residents. Included are lounges, dining facilities, a twenty-four-hour vending snack bar, the Recovery Room (a turn-of-the-century grill-lounge), bowling lanes, billiards and table tennis, music and art display lounges, a bookstore, a barber shop, a staff of resident counselors, residence halls student government programs, and study facilities.

IX-5.3. Additional information and application forms for both the apartments and residence halls may be obtained from:

Housing Office
University of Illinois at the Medical Center
818 South Wolcott Street
Chicago, Illinois 60612
(312) 996-7020

The Departments

ANATOMY

The goal of graduate training in anatomy is to develop research scholars who are prepared to engage in creative work in some field of morphological or experimental biology and to train competent teachers in the morphologically oriented sciences. The fields of study open to a graduate student are: functional and evolutionary morphology, cell structure and function, developmental biology, immunobiology, endocrinology, and neurobiology. Students interested in functional and evolutionary morphology may utilize the facilities and take courses in the Center for Graduate Studies at the Field Museum of Natural History.

Preference for admission is given to students who intend to complete a doctoral program.

All entering students are expected to complete AN-303, AN-340, AN-341, and AN-342. All graduate students are required to serve as laboratory teaching assistants each year as part of their degree training program.

Graduate Faculty

Professors: Herbert R. Barghusen, Louis A. Benevento, E. Lloyd DuBrul (Emeritus), Robert H. Krehbiel (Emeritus), Arthur LaVelle, Edward Polley, Keen A. Rafferty, Jr., W. Ann Reynolds, Pierson J. Van Alten, Ralph M. Wynn.

Associate Professors: Conwell H. Anderson, Joel L. Cracraft, Susan W. Herring, Robert E. Kelly, Howard G. Sachs.

Assistant Professors: Edgar F. Allin, MaryBeth T. Buschmann, Richard Stark, Harold G. Verhage.

Lecturers: Helen C. Maibenco, Anthony J. Schmidt.

Participating Staff

Professor: Harry Monsen.

Assistant Professors: Robert Becker, Rochelle Cohen, Michael Rezak.

AN-303. Human Neuroanatomy. Morphological organization of the nervous system. Functional correlations of neural structures. W or Sp. 4 qh. LaVelle.

AN-304. Gross Anatomy — Biomechanics of Head and Neck. Dissection of human body. Consideration of development of organ systems. X-ray anatomy. No prerequisites other than basic courses in biology, zoology, etc. F. 6 qh. Barghusen.

AN-305. Gross Anatomy — Biomechanics of Head and Neck. Functional anatomy of the face and oral apparatus. The structural composite is studied as an adaptive product of organic evolution. Prerequisite: AN-304. W. 4 qh. Barghusen.

AN-320. Medical Gross Anatomy.† F. 2 qh. Monsen.

AN-321. Medical Gross Anatomy.† W. 2 qh. Monsen.

AN-322. Medical Gross Anatomy.† Sp. 2 qh. Monsen.

AN-325. Medical Histology.† F. 2 qh. Kelly.

AN-326. Medical Histology.† W. 1 qh. Kelly.

AN-327. Medical Histology.† Sp. 1 qh. Kelly.

AN-330. Medical Neuroanatomy.† W. 1 qh. Polley.

AN-331. Medical Neuroanatomy.† Sp. 2 qh. Polley.

AN-340. Gross Human Anatomy. Gross morphology and function of the human body. Prerequisites: college biology or equivalent, and consent of instructor. F. 5 qh. Allin.

AN-341. Gross Human Anatomy. Gross morphology and function of the human body. Prerequisites: AN-340 and consent of instructor. W. 5 qh. Allin.

AN-342. Cell Structure and Human Histology. Structure and function of cells and fundamental tissues. Function and microscopic anatomy of organs. Prerequisite: consent of instructor. F. 5 qh. Van Alten.

AN-343. Human Embryology. Sp. 3 qh. Stark.

AN-360. Morphology of Pelvic Structures. Functional gross and microanatomy of the pelvis and pelvic viscera. Prerequisites: AN-101, or equivalent; PY-201 or equivalent; BC-101 or equivalent. F. 3 qh. Krehbiel.

AN-370. Growth and Form. A survey of biological patterns of shape and size and their formation. Topics include physical and chemical basis of form, biological consequences of size, morphometric analysis of size and shape, mechanisms of pattern formation, and growth mechanisms of vertebrates. 3 qh. Cracraft, Herring.

AN-372. Cell Biology. A basic course covering the morphology and life processes of the cell as an organism. Ultrastructural physiology of cells, their organelles and intracellular systems. F. 3 qh. (Same as PY-372.) Sachs.

AN-412. Functional Cytology. A lecture and seminar course in cell biology, emphasizing the structural basis of cellular function. Prerequisite: AN-342 or equivalent. 4 qh.

AN-413. Functional Analysis of Cultured Cells. Principles and methods in initiation of cell cultures and in study of their functions. Emphasis is placed upon analysis of morphology and of product, and upon experimental regulation of these features. Prerequisites: AN-325, AN-326, and AN-327; or AN-342. Sp. 5 qh. Rafferty.

AN-420. Concepts of Synaptic Function and Morphology. Overview of current and classical methods employed in the study of synapses. A review of some of the most interesting aspects of synaptic function, such as sources of synaptic vesicles, synaptic patterns, synaptic plasticity, and synaptic specificity.

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† Medical course listings require completion of consecutive quarters and final comprehensive examination for credit evaluation. Students not registered in the College of Medicine will require approval of the head of the Department of Anatomy.

Prerequisite: neuroanatomy. F (to be offered in 1978). 2 qh. Polley.

AN-426. Topics in Advanced Neuroanatomy. Review and analysis of current selected concepts of the morphology, organization, and development of neural pathways. Current and recent anatomical studies of mammalian neural pathways will be discussed as an extension and elaboration of pathway studies in 300 level courses. Prerequisite: AN-303. Sp (to be offered in 1979). 3 qh. Polley.

AN-431. Experimental Neurocytogenesis. Factors underlying the inductance, differentiation, and subsequent maturation of the vertebrate neuron. The genesis of behavioral patterns, organelles, and certain enzyme systems in relation to neuronal development. Prerequisites: descriptive embryology and histology. F (to be offered in 1978). 3 qh. LaVelle.

AN-433. Ultrastructural Anatomy of Tissues and Cells. Analysis and interpretation of electron micrographs of organelles and cells in general and of organelles and cells in specific tissues as correlated with specific functional morphology. Prerequisite: AN-342 or consent of instructor. Sp (to be offered in 1978). 3 qh. Buschmann.

AN-434. Developmental Immunobiology. The relationship of immunology to problems of development in terms of the capacity of the embryo, fetus, or neonatal animal to respond immunologically to antigenic stimulation. Immunological methods as tools for the study of antigenic determinants in the developing embryo. Prerequisites: AN-342 and MI-402. W (to be offered in 1979). 3 qh. Van Alten.

AN-435. Morphologic and Physiologic Adaptations to Growth, Aging, and Injury. Analysis of biological structure and physiology in vertebrate growth, aging, and injury. Prerequisites: Gross Anatomy; AN-342, AN-303. Sp (to be offered in 1978). 3 qh. Maibenco.

AN-436. Evolution of Functional Complexes in Vertebrates. Adaptive modifications in functional complexes as observed in comparative studies of living vertebrates and the phylogenetic studies of fossil lineages. Methods of describing and interpreting morphological modification with emphasis on the biomechanics of the skeletal system. Prerequisite: Gross Human Anatomy or Comparative Anatomy or consent of instructor. Sp (to be offered in 1979). 4 qh. Barghusen.

AN-437. Cell Biology of Vertebrate Repair and Regeneration. An analytical and conceptual examination of the cytoarchitecture and molecular ecology of amphibian appendage regeneration, correlated with specific tissue responses to trauma and subsequent repair in all vertebrates. Prerequisite: Human Histology or equivalent. Sp (to be offered in 1979). 4 qh. Schmidt.

AN-438. Mammalian Feeding Mechanisms. Survey of oral adaptations in mammals: evolution and functional morphology of teeth, masticatory muscles, and jaw mechanics. Prerequisite: human gross anatomy or comparative anatomy. 3 qh. Herring.

AN-440. Special Topics in Anatomy. (Consult department for subtitle.) F, W, Sp, Su. 2 to 3 qh. Staff.

AN-441. Special Topics in Anatomy: Fetal Anatomy. Sp. 2 qh. Stark.

AN-442. Special Topics in Anatomy: Evolutionary Morphology. Lecture-seminar series on topics in evolutionary morphology including principles of systematic biology, evolutionary mechanisms, growth and form, and vertebrate structure and function. W or Sp. 3 qh. Cracraft.

AN-454. Neuroendocrinology. Survey of neuroendocrine integration including neuroendocrine regulation of development, homeostasis, reproduction, and behavior. The hypothalamo-hypophyseal axis receives special attention from both morphologic and functional viewpoints. Prerequisite: AN-303. F (to be offered in 1977). 3 qh. Anderson.

AN-455. Brain Mechanisms. Lectures and discussions based on original papers which use current approaches and theories in order to understand and reveal the correlation between brain morphology and function. The basis for information processing and integration on the neuronal level, from the receptor to neocortex, is emphasized as well as anatomical and physiological techniques, theories, approaches, and data interpretation. Prerequisites: AN-303, PY-369, or equivalent, with consent of instructor. Sp (to be offered in 1978). 2 qh. Benevento.

AN-491. Seminar and Journal Club. Presentation of research by invited lecturers; presentation of current literature and research by students. F, W, Sp. 0 to 2 qh. Staff.

AN-493. Research in Anatomy. F, W, Sp, Su. 1 to 16 qh. Staff.

BIOENGINEERING (Intercampus)

The intercampus bioengineering program offers work leading to the Doctor of Philosophy degree. It is designed primarily for students with degrees in physical sciences, engineering, mathematics, biology, or medicine. Students from other areas will be encouraged to apply if their backgrounds indicate a reasonable chance of success in the program.

Bioengineering trains the student to apply engineering concepts and methods to the life sciences and medicine and to conduct research that will develop systems that apply modern technology to problems of living systems and health care. It includes the application to living systems of the principles of information processing, communication and control theory; cybernetics, artificial intelligence and pattern recognition; bioinstrumentation, prostheses and artificial organs; and some aspects of biophysics. Students from the life sciences are expected to emphasize mathematics, engineering, and physical sciences in their initial course work; students from the physical sciences are expected to concentrate initially on the life sciences.

The Doctor of Philosophy in Bioengineering is jointly administered by the College of Engineering at the University of Illinois at Chicago Circle and the University of Illinois at the Medical Center through the Intercampus Bioengineering Coordinating Committee. Applicants for admission to this program enter one Graduate College, either at the Medical Center or at the Chicago Circle campus, in accord with admission standards prevailing at that campus. GRE scores, including advanced in field of previous degree, are required.

Since students may enter the program from a variety of disciplines, some will have deficiencies in a number of areas. To remove deficiencies in prerequisites or background requirements, the student may be required to take undergraduate or specialized remedial courses, chosen in consultation with the adviser. Otherwise, the program in bioengineering requires 144 quarter hours of credit beyond the baccalaureate, consisting of a reasonable distribution of course work between the Chicago Circle and Medical Center campuses.

There are four areas of concentration: health care and environmental systems; medical instrumentation; physiological systems and biocontrol; and prosthetics and artificial organs. The student must complete in one of these areas at least 36 quarter hours of required courses and electives chosen in consultation with the adviser. In addition to these areas of concentration, a student with other interests may design his own area of concentration in consultation with the adviser, subject to approval by his doctoral advisory committee.

Some courses from both campuses are required of all students: at the Medical Center campus, three of PY-369, PY-370, PY-371, PY-469, PY-470, PY-471, with at least two 300-level courses and at most one associated laboratory; BioS-363 (Chicago Circle campus) may be substituted for PY-370 and BioS-364 may be substituted for PY-371; at Chicago Circle campus, BE-354, BE-379, and BE-497, plus 6-12 quarter hours internship.

Graduate students at the Medical Center who wish to pursue the M.S. degree in Bioengineering may do so by means of an Intercampus Agreement with Chicago Circle.

Note: Many courses pertinent to the graduate program in bioengineering are offered by other Chicago Circle engineering departments and at the Medical Center. Students should consult the appropriate listings for details.

Graduate Faculty

Professors: Gyan C. Agarwal,* Lyndon R. Babcock, Jr., Riad Barmada, Louis A. Benevento, Joseph C. F. Chow,* Daniel Fiat, Morton F. Goldberg, Earl E. Gose,* Alois R. Hastreiter, Sidney Levitsky, Edward A. Lichter, Ruy V. Lourenco, Thaddeus J. Marczynski, Sabath F. Marotta, Bruce H. McCormick,* Irving F. Miller,* William D. O'Neill,* Kenneth M. Rosen, William Rostoker,* Albert Schultz,* Roderich W. Walter, Arthur H. Wolff, Bert L. Zuber.*

Associate Professors: John P. Bederka, Badi M. Boulos, Svante O. Rolander, Richard A. Wadden.

Assistant Professors: Gary Brenniman, Gordon L. Humphrey, Alvin L. Miller, Jacob T. Wilensky.*

BE-307. **Pattern Recognition I.** The design of automated classification systems; decision theory; parametric and nonparametric procedures to the classification of patterned data sets; clustering and unsupervised learning. Prerequisite: SysE-342 or Math-370. F. 4 qh. Gose.

BE-315. **Mechanics of the Human Musculo-Skeletal System.** Use of rigid and deformable body statics and rigid body dynamics to analyze various aspects of the human musculo-skeletal system from the viewpoint of engineering mechanics. Skeletal structure, kinematics of body joints, and mechanical properties of body tissue. Anthropometry, motion range measurement, kinematic analyses, statically determinate and indeterminate analysis of body forces, stress analyses, and dynamic response analyses. Applications of mechanics to health problems. Laboratory experiments and computational projects. Prerequisites: BioE-393, Special Problems (Biomechanics), or both MatE-204, Mechanics of Solids I, and MatE-211, Dynamics of Rigid Bodies, or consent of instructor. W. 4 qh. (Same as MatE-315.) Schultze.

BE-341. **Man-Machine Systems.** Specific system areas in which the role of man in the system operation requires a systematic analysis of the human component in the system. Critical concepts, variables, and techniques involved in optimum design of human operated systems. Laboratory experiments on man-machine interactions. Prerequisite: SysE-315. Sp. 4 qh. Agarwal.

BE-350. **Prostheses and Artificial Organs.** The special problems encountered in the design of organ replacements as engineering devices; sub-organ replacements, circulatory assist devices, artificial kidneys, and other organ systems. Prerequisites: BioE-200, BioS-363, BioS-364, MatE-230, and EnrE-211, or the equivalents. W. 4 qh. Miller.

BE-352. **Biocontrol.** Applicability of control systems theory to physiological systems, including the pupil system and eye and hand movement systems, by utilizing such techniques as Fourier analysis, Nyquist stability criteria, and cross-correlation. Prerequisites: InfE-311 and InfE-383 or InfE-384. Sp. 3 qh. Zuber.

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* Chicago Circle Staff.

BE-353. **Biocontrol Laboratory.** Experimental counterpart of BE-352. Motor coordination, crayfish photoreceptor, human pupil, eye movement. Prerequisite: credit or registration in BE-352. Sp. 3 qh. Staff.

BE-354. **Bioinstrumentation: Transducers.** Energy conversion; detailed discussion of transducers used in biological research. Prerequisites: BioE-200, InfE-240, InfE-311. W. 4 qh. Zuber.

BE-355. **Engineering Biophysics.** Introduction to biophysical mechanisms at the molecular, cellular, and organ levels. Thermodynamic aspects of biological processes, solutions of macromolecules; chemical equilibrium and kinetics; transport processes; diffusion; viscosity; quantitative description and modeling of biophysical mechanism. Prerequisites: Math-220, EnrE-201 or Chem-114, and any two of BioS-100, BioS-101, BioS-102. F. 4 qh. Miller.

BE-356. **Materials in Bioengineering.** Analysis of problems associated with prostheses and other implanted devices, both medical and dental. Prerequisites: MatE-230, BioS-363 or BioS-364. Sp. 4 qh. Rostoker.

BE-359. **Neuroanatomy.** Introduction to the neurological organization of the mammalian central nervous system. Prerequisites: BioS-280 and consent of the instructor. F. 5 qh. Shomay.

BE-379. **Real-Time Data Processing.** Techniques for acquisition and digital representation of data obtained from analog and digital devices. Methods for digital signal processing. Data reconstruction and display. Applications such as medical data acquisition and analysis and closed loop sampled data control. Implementation of techniques on a real-time dedicated mini and micro computer. Individual projects are required. Prerequisites: Math-195, InfE-311, or equivalent. F, Sp. 4 qh. Staff.

BE-380. **Physiological Application of Real-Time Data Processing.** Application of on-line real-time data processing techniques to problems in physiological experimentation, patient monitoring systems, and problems associated with biological data. Projects will include the acquisition and processing of biological data on a small dedicated laboratory computer. Prerequisite: credit or registration in BE-379. W. 3 qh. Staff.

BE-391. **Seminar.** Topics to be arranged. May be repeated for additional credit. Prerequisite: consent of the instructor. F, W, Sp. 1 to 4 qh. Staff.

BE-393. **Special Problems.** Special problems or readings by arrangement with the faculty. May be repeated for additional credit. Prerequisites: senior standing and consent of the instructor. F, W, Sp. 2 to 4 qh. Staff.

BE-407. **Pattern Recognition II.** Computer-based methodology for the organization and representation of knowledge; knowledge-based pattern recognition; inference of pattern descriptions; applications to clinical decision support, processing of natural language, and robotics. Prerequisite: BE-307. W. 4 qh. Gose.

BE-409. **Pattern Recognition III.** Advanced pattern recognition techniques and applications. Projects. Review of current literature. Prerequisites: BioE/InfE-407, Pattern Recognition II. Sp. 4 qh. (Same as InfE-409.) Gose.

BE-451. **Advanced Biocontrol.** Mathematical modeling and analysis of biological systems, emphasizing techniques of control engineering; laboratory experiments on control systems of pupil eye movement and sensory motor coordination. Prerequisite: BE-353. F (to be offered in 1979). 4 qh. Zuber.

BE-453. **Advanced Systems Physiology.** Intensive treatment of selected neurophysiological topics; emphasis on systems organizations. Prerequisite: BE-353. Sp (to be offered in 1978). 4 qh. Staff.

BE-457. **Analysis of Visual Systems.** An advanced course covering in detail important research areas of the visual system. The fundamental importance of physical, chemical, and physiological processes as related to vision is stressed. Prerequisites: InfE-453 and consent of the instructor. 4 qh.

BE-460. **Biotransport I: Diffusional Processes.** Principles of solute and water transport across natural and synthetic membranes; natural and artificial membrane structure and function; passive and active membrane transport processes; excitability; irreversible thermodynamics as applied to membrane transport. Prerequisites: EnrE-304, or BE-355 and consent of instructor. W. 4 qh. Miller.

BE-461. **Biotransport II: Flow Processes.** Principles of flow in living systems; structure and function of human circulatory system; rheology of blood and other biofluids; microcirculation; pathological conditions and their detection; gas transport. Prerequisite: EnrE-317 or BE-355. Sp. 4 qh. Chow.

BE-484. **Bioinstrumentation: Systems.** Analysis of systems used in biological and medical instrumentation; general principles and specific electrical, mechanical, and optical aspects of instrumentation systems. Prerequisite: BE-354. F (to be offered in 1978). 3 qh. Zuber.

BE-490. **Internship in Bioengineering.** Current clinical practice experience in a health care setting culminating in a written and oral report. May be repeated; a minimum of 6 quarter hours is required of all doctoral students. Prerequisite: PY-371 or equivalent, BE-354, and consent of instructor. F, W, Sp. 1 to 4 qh. Miller.

BE-493. Individual Research. Research on special problems not included in thesis research. Prerequisite: consent of instructor. F, W, Sp. 2 to 8 qh. Staff.

BE-497. Colloquium on Bioengineering. Recent innovations in bioengineering theory and practice presented by invited speakers, faculty, and doctoral students. All doctoral students in the program are required to attend during every term of their residence and make at least one presentation. F, W, Sp. 0 to 1 qh. Miller.

BE-498. Seminar on Bioengineering. Systematic review of special topics; emphasis on current research. Prerequisite: consent of instructor. W. 1 to 4 qh. Staff.

BE-499. Thesis Research. Research on thesis topic. May be repeated for a maximum of 16 quarter hours credit. Prerequisites: consent of instructor and approval of research prospectus by thesis adviser. F, W, Sp. 0 to 16 qh. Staff.

BIOLOGICAL CHEMISTRY

The objective in graduate training in the Department of Biological Chemistry is to provide optimal opportunities for modern biochemical research. Although the orientation is not particularly clinical, the location in a large and active medical center provides an ideal environment for fundamental biochemical studies at all biological and medical levels.

Since the approach to biological chemistry may be primarily chemical or biological, the requirements for graduate work in the department are flexible enough to permit admission of individuals of quite different backgrounds. Undergraduate training should include 16 semester hours of chemistry, including organic and quantitative analysis; 8 semester hours of physics, including laboratory work in electricity, heat, mechanics, and sound; and at least one thorough course in biology. Completion of 6 semester hours of formal course work at the college level in French, German, Russian, or Spanish satisfies the departmental language requirements. For nonprofessional students admission preference is given to those who seek the Ph.D. degree. In addition to the research and formal course work requirements, each full-time student, regardless of source of financial support, is required to spend one quarter of each year assisting in the teaching program of the department.

Candidates for degrees in biological chemistry are required to take BC-361, BC-362, BC-391 (2 qh), BC-410, BC-411, BC-463, BC-491 (4 qh), and BC-493. A minor in biological chemistry should include BC-361, BC-362, BC-491 (3 qh), and at least 5 quarter hours of formal 400-level course work in biological chemistry.

The thesis must be of sufficient merit to warrant publication in full or in part in a recognized scientific journal.

Graduate Faculty

Professors: Michael Bárány, Clyde C. Doughty, Henry Gewurz, Mary Sue Hanlon, Henry Jeffay, Janos Molnar, Terrell C. Myers, Samuel Nerenberg, Mariano Tao, Edward B. Titchener, Bernard Weissmann.

Associate Professors: C. Arsenis, Robert T. Chatterton, Bernard Friedenson, Thomas O. Henderson, Ralph Kathan, T. Rajkumar, Newton Ressler, Arnold D. Steinberg, James Vary.

Assistant Professor: Paul Morris.

BC-311. Introduction to Biological Chemistry. Prerequisite: organic chemistry. F. 5 qh. Arsenis.

BC-361. Biological Chemistry. Discussions of the chemistry and metabolism of carbohydrates and proteins. Includes the elements of enzymology. F. 5 qh. Myers and Staff.

BC-362. Biological Chemistry. Discussion of the metabolism of lipids, proteins, and nucleic acids; biological oxidation. Prerequisite: BC:361. W. 5 qh. Myers and Staff.

BC-391. Biochemical Literature Review. Discussion of assigned articles from biochemical journals; course is designed to acquaint the students with biochemical literature preparatory to beginning research. F, W, Sp. 1 qh. Staff.

BC-401. Chemistry and Genetics of Immunoglobulins. Chemistry of antigens, antibodies, immunoglobulins, and complement; qualitative and quantitative immunochemical analysis; antigen-antibody reactions; cross-reactions and inhibition reactions. F (to be offered in 1978). 5 qh. (Same as MI-401.) Friedenson, Knight.

BC-410. Biological Research Techniques. Laboratory exercises and discussions concerned with the principles and practical aspects of quantitative biochemical methodology. Illustrations include spectrophotometry, chromatography, pH measurements, radioisotope measurement, and enzyme kinetics. W. 5 qh. Weissmann.

BC-411. Biological Research Techniques. Laboratory, lectures, and exercises illustrating the practical aspects of biochemical methodology; working methods in analytical biochemistry and protein chemistry. Sp. 5 qh. Friedenson.

BC-413. Physical Biochemistry. The course presents the nature of physical biochemical problems and then considers the techniques employed in solving these problems. Prerequisites: biological chemistry, physical chemistry, or equivalent. W (to be offered in 1979). 3 qh. Hanlon.

BC-416. Biochemistry and Physiology of Muscle Contraction. The structure and function of myosin, actin, tropomyosin, troponin, and the sarcoplasmic reticulum; the control, energetics, and mechanism of muscle contraction. W. 3 qh. (Same as PY-416.) Bárány.

BC-431. Bacterial Genetics. A lecture and tutorial course on understanding the genetics of bacteria and bacteriophage. Subjects include: structure and function of bacterial nucleus, chromosome, genes, gene replication, variation, mutation, transformation, transduction, conjugation, bacteriophage-host relationships, lysogeny, transfer of episomes and plasmids, analysis of recombinants, and chromosome mapping. Course includes critical evaluation of classical and current literature in tutorial sessions. Prerequisites: MI-351, MI-352, and MI-353; BC-361, or consent of instructor. W (to be offered in 1978). 5 qh. (Same as MI-431.) Reiter.

BC-440. Special Topics in Biochemistry. Advanced course dealing with selected topics in biochemistry. The particular subjects vary from year to year, but may include subjects such as biochemistry of hormones, structure and properties of membranes, transport systems and receptor sites, biopolymer sequencing techniques, and regulation of eukaryotic gene expression. The course will be lectures and discussion. Prerequisites: BC-361 and BC-362. F, W, Sp. 2 to 4 qh. Staff.

BC-463. Biological Chemistry. Membrane biochemistry; hormonal control of metabolism; biochemistry of specialized tissues. Prerequisites: BC-361 and BC-362. Sp. 5 qh. Molnar and Staff.

BC-464. Recent Trends in Clinical Chemistry. Studies based upon fundamental biochemistry and current theories in the literature: nature and variations, in health and disease, of serum proteins and serum enzymes; electrophoresis; use of enzymes as diagnostic reagents; the role of computers in clinical chemistry; and reading assignments presented and discussed. Prerequisites: BC-361 and BC-362, or equivalent. Sp. 1 qh. (Same as PA-464.) Ressler.

BC-491. Seminar and Journal Club. Student and faculty presentation of assigned subjects of current importance in biological chemistry and related fields. Prerequisite: BC-391. F, W, Sp. 1 qh. Staff.

BC-493. Research in Biological Chemistry. F, W, Sp, Su. 1 to 16 qh. Staff.

BIOLOGY AND EXPERIMENTAL PATHOLOGY

(Intercampus)

The intercampus biology and experimental pathology program offers work leading to the Doctor of Philosophy degree. It is designed to provide advanced professional training for those exceptionally well qualified candidates who aspire to careers as teacher-scholars in institutions of higher education, or who seek to become research scientists in a wide range of public and private agencies. The intercampus doctoral program is intended to give each student a broad understanding of the life sciences as a whole and intense training in sub-areas of specialization including evolutionary and environmental biology, regulatory biology, and experimental pathology. A unique aspect of the program is that it provides students with an opportunity to compare normal and abnormal life processes at biochemical, functional, and morphological levels of organization.

In addition to the usual requirements for the Ph.D. degree, at the discretion of the student's advisory committee and with the approval of the Cooperative Governing Committee, the student may be required to demonstrate a reading knowledge of one or two foreign languages.

This is a cooperative program between the Department of Biological Sciences of the Chicago Circle campus and the Department of Pathology of the Medical Center campus administered by an Intercampus Governing Committee. Applicants for admission to this program enter one Graduate College, either at the Medical Center campus or the Chicago Circle campus in accord with admission standards prevailing at that campus. Students enrolled in this cooperative program will have available to them the combined resources of the Chicago Circle and Medical Center campuses. Applicants who wish further information may write to either department.

A complete listing of graduate faculty may be obtained by referring to the department heading PATHOLOGY and the *UICC Graduate Bulletin* under the heading BIOLOGICAL SCIENCES.

In addition to those courses listed under PATHOLOGY, a complete listing of courses offered by the Department of Biological Sciences can be obtained by referring to the *UICC Graduate Bulletin.*

GRADUATE COLLEGE ELECTIVES

The following courses offered at the Medical Center campus are in areas which have no graduate degree programs. They are available as electives in all disciplines upon approval of the major adviser. They carry a Graduate College code for identification.

GC-301. Human Genetics. A course in fundamentals of human genetics for beginning graduate students or as an elective course in the professional schools. Stress will be on the action of genes in the transmission and development of normal and abnormal traits. W. 3 qh. Center for Genetics Staff.

GC-360. Mathematical Methods for Health Scientists I. Partial differentiation, multiple integrals, and differential equations. Applications to problems in the health sciences. Prerequisite: calculus. Sp (to be offered in 1978). 4 qh. Grundman.

GC-362. Probability and Statistical Inference I. The theory of probability; averages; dispersion; theory and techniques of sampling; testing of hypotheses. Applications to problems in the health sciences. Prerequisite: calculus. W. 4 qh. Grundman.

GC-363. Probability and Statistical Inference II. Distributions related to binomial and normal distributions; estimation; Chi Square distribution; curve fitting; correlation; the analysis of variance; nonparametric statistics. Applications to problems in the health sciences. Prerequisite: GC-362. Sp. 4 qh. Grundman.

GC-365. Mathematical Methods for Health Scientists II. Determinants and linear equations, vectors, linear algebra, matrices and linear transformations. Applications to problems in the health sciences. Prerequisite: calculus. Sp (to be offered in 1979). 4 qh. Grundman.

GC-401. Biometrics and Applied Statistics. This course is designed for health science professionals and involves rational use of statistical techniques. Emphasis is placed on design of experiments, regression analysis, and use of the computer in statistical evaluation of results. Students from various fields recognize similarities among problems from different fields of application. This provides a broader scientific approach to recent trends in statistical methods rather than a similar course taught with familiar examples in individual disciplines. W, Su. 5 qh. Patel.

HEALTH PROFESSIONS EDUCATION

The graduate program in health professions education is administered by the Center for Educational Development, the research and development support unit for academic programs at the Medical Center. The principal aim of the graduate experience is to prepare biomedical practitioners to assume positions of educational leadership. Candidates who fulfill all degree requirements are awarded the Master of Health Professions Education (MHPE) degree. This degree certifies readiness to serve as an academic program director; educational program planner, administrator, or evaluator; or as a specialist in instructional technology and biomedical communications.

The program of study, which includes formal courses, supervised research, and opportunities for independent study, is aimed toward a series of learning objectives that specify minimum expectations of all students.

Persons who hold a baccalaureate or an advanced degree in one of the health professions or in a health-related field are encouraged to apply for admission. Applicants whose formal training is not in a health-related field must have at least one year of full-time employment in a health professions setting. An interdisciplinary student body is sought.

Graduate Faculty

Professors: Raynard J. Dooley, Phillip M. Forman, Ruth M. French, Christine H. McGuire, George E. Miller, Agnes Rezler, Thomas V. Telder.

Associate Professors: Eta S. Berner, Richard P. Foley, Thomas E. Gamble, Howard G. Getz, Anthony LaDuca, Henri R. Manasse, Abdul Sajid.

Assistant Professors: Thomas W. Beckham, Phyllis Blumberg, Marshall Browdy, Francis M. Ciurczak, John D. Engel, William L. Holzemer, William C. McGaghie, Michael A. Melnik, Victor Rezmovic, Mary E. Risley, Jonathan Smilansky, Annette Yonke.

ED-309. Current Issues in Health Professions Education. Seminar participants will examine a set of problems currently facing the health professions (e.g., the nature of health service delivery systems, the selection of students, the process of certification and licensure) and their implications for health professions education. Discussion will build upon available data, the nature of the issues, the forces that have led to present practices, and the advantages/disadvantages of alternative actions. 4 qh. Miller, Forman.

ED-310. Fundamentals of Evaluation in Educational Decision-Making. The course is designed to provide an overview of the elements of the educational decision-making process and of the information and evaluation support system required to inform that process. Alternate evaluation models are considered and compared; advantages and limitations of alternate approaches to data collection are examined. Each student will develop a detailed plan for gathering and analyzing the data requisite to a decision on a selected evaluation problem. 4 qh. McGuire.

ED-311. Psychology of Learning. Students will relate educational psychological principles to instructional settings (didactic, clinical, etc.) for the health professions. Implications for curriculum development, instructional methodology, and evaluation of student performance will be determined. 3 qh. Yonke.

ED-348. Fundamentals of Curriculum Development. This course is designed to provide an introduction to adult learning and its relationship to educational program planning. Several theoretical models for planning and reviewing health professions curricula at the course and institutional levels are described, as are methods of curriculum implementation. Students will identify an individual curriculum problem in the health professions and outline a systematic approach for its solution. F, Sp. 4 qh. Browdy.

ED-350. Practicum Seminar. The seminar is intended to assist students to identify a topic in health professions education that will subsequently become the focus for individual thesis research. Selections from the literature on health professions education are studied and particular attention is given to formulating researchable problems, research and evaluation techniques, and research ethics. F. 4 qh. McGaghie.

ED-351. Practicum Seminar. Continuation of ED-350. 2 qh. McGaghie.

ED-370. Instructional Methods. This course will introduce the learner to the effective use of the lecture, laboratory demonstrations, group discussion, and other instructional methods. Observational analysis and video-tape will be used as aids in the practice of these techniques in simulated classroom settings. W, Sp. 4 qh. Foley, Melnik.

ED-375. Using Media in Instructional Design. The course is intended to assist health professions students to design simple instructional materials relevant to a course or a unit of teaching. Learners will become proficient in the application of systematic process of materials development through the use of such educational technologies as slide-sound, television, and audiotutorials. Sp. 3 qh. Hendricson.

ED-390. Elements of Educational Research. This course provides an overview of common research methods, research designs, and statistical methods used in educational research. Emphases are placed on the utility of various research designs, the relationship of behavioral hypotheses and statistical hypotheses, and appropriate statistical methods for particular statistical hypotheses. W. 4 qh. Rezmovic.

ED-391. Construction and Use of Tests to Measure Cognitive Performance. Students will relate testing to education objectives and curriculum in health professions. The construction, administration, scoring, analysis, and critique of various types of test items designed to measure higher cognitive level achievement will be covered. 4 qh. Engel, Risley.

ED-395. Clinical Assessment Techniques. The construction and appropriate use of observation techniques, written simulations, and chart audit are presented in relation to the evaluation of clinical performance. 4 qh. Berner.

ED-401. Curriculum Design and Organization. This advanced course features detailed analyses of factors influencing health professions curriculum design and curriculum organization. Such factors as the educational context, the need to make summative decisions about learner achievement, and definitions of competent professional practice are addressed from the standpoint of curriculum research. Su. 4 qh. LaDuca.

ED-405. Instructional Supervision and Evaluation. This course is designed to provide health professionals with the opportunity to develop knowledge and skills in the area of instructional supervision and evaluation. Supervisory theory and practice as well as faculty evaluation will be treated within the framework of both overall program development and work with individual faculty. 4 qh. Telder.

ED-410. Biomedical Communication. Students will apply communication theory to questions about the improvement of instruction in the health sciences. The emphasis is given to the analysis of selected communication models and their relationship to learning theory and instructional technology. Su. 4 qh. Sajid.

ED-415. Program Evaluation. Students will examine and use strategies of program evaluation, including analysis of system components and data collection techniques for assessing both process and product in judging the effectiveness of educational programs for health professionals. Su. 3 qh. Holzemer.

ED-483. Independent Study in Health Professions Education. Students may negotiate a specific topic for study with a faculty member. F, W, Sp, Su. 1 to 4 qh. Staff.

ED-493. Research in Health Professions Education. F, W, Sp, Su. 1 to 16 qh. Staff.

HISTOLOGY

The graduate program of the Department of Histology in the College of Dentistry provides training for teachers and investigators in the field of histology as it applies more specifically to the basic sciences related to dentistry. Graduate study in histology leads to the M.S. degree. Faculty members of the department have background in a number of different disciplines; students thereby have a variety of opportunities for specialization within the degree in preparation for careers in many facets of oral biological science.

Students completing the requirements for a master's degree in histology may apply for admission for work toward the Ph.D. degree in anatomy and must comply with requirements of that discipline for the doctorate.

Graduate Faculty

Professors: Hubert R. Catchpole, Luis De La Torre, Dale R. Eisenmann, Milton B. Engel, Arthur F. Grimm, Julia Meyer, Tawfik Y. Sabet, Dennis F. Weber, A. E. Zaki.

Associate Professor: John Everingham.

DH-301. General Histology. Lectures and laboratory exercises in microscopic anatomy of the various tissues of the body and their functional significance. Prerequisites: college biology and consent of instructor. F. 4 qh. Sabet and Staff.

DH-302. General Histology. Lectures and laboratory exercises in microscopic anatomy of the various tissues of the body and their functional significance. Prerequisite: DH-301 or consent of instructor. W. 4 qh. Everingham and Staff.

DH-351. Oral Histology. Lectures and laboratory exercises in microscopic anatomy and functions of the tooth, periodontium, and the orofacial complex including cytologic and developmental features. Prerequisites: DH-301, DH-302, or equivalent and consent of instructor. Sp. 4 qh. Zaki and Staff.

DH-401. Advanced Oral Histology. Lectures and discussions pertaining to special subjects and problems in oral histology. Prerequisite: general histology. F. 3 qh. Zaki and Everingham.

DH-403. Biology of Mineralized Tissues. Lectures and discussions concerning the formation, structure, and functions of bone, dentin, and enamel, with emphasis on mechanisms of mineralization. Prerequisite: general histology and consent of instructor. W. 3 qh. Eisenmann.

DH-404. Fine Structure of Oral Soft Tissues. Discussions of electron microscopic methods as applied to investigations in oral biology with special stress on interpretation of fine structure of oral soft tissues. Prerequisite: general histology and consent of instructor. Sp (to be offered in 1979). 3 qh. Zaki.

DH-405. Advanced Oral Histology: connective tissue. Lectures, discussions, and laboratory demonstrations on the structure and functions of connective tissue. Prerequisites: general histology and consent of instructor. W. 3 qh. Engel.

DH-406. Advanced Oral Histology: lymphoid tissues. Lectures and discussions on the structure and functions of lymphoid tissues. Prerequisite: general histology and consent of instructor. Sp (to be offered in 1980). 3 qh. Sabet.

DH-407. Physiological Basis of Pathology. Lectures and discussions on basic biologic mechanisms as they relate to various pathologic conditions. Prerequisite: consent of instructor. Su. 3 qh. (Same as PA-407.) Catchpole.

DH-493. Research in Histology. F, W, Sp, Su. 1 to 16 qh. Staff.

MEDICINAL CHEMISTRY

Medicinal chemistry is the application of scientific principles to the design, synthesis, structure elucidation, and analysis of chemical compounds possessing biological activity. Research in medicinal chemistry is directed toward the correlation of biological activity with chemical structure, physical properties, reaction rates and mechanisms, and drug metabolism. In order to carry out these investigations, the departmental laboratories are equipped with chromatographic equipment; infrared, ultraviolet, nuclear magnetic, and mass spectrometers; and equipment required for radiotracer methodology. The department operates a biological screening program which furnishes biological data for students engaged in research activities.

The program is designed to train students for careers in both teaching and research. Students who have completed the program, and have chosen a research career, are currently employed in industrial and government laboratories. While the program is oriented to the design of drugs and pharmaceuticals, the use of similar approaches for the design of all products used for their biological activity (i.e., pesticides and herbicides) permits graduates to find research opportunities in many industries.

The applicant's undergraduate education should include: 36 semester hours of chemistry, including at least 10 hours of general chemistry, 4 hours of analytical chemistry, 8 hours of organic chemistry; 8 semester hours of physics; 6 semester hours of mathematics; and at least one course in biology. Calculus and physical chemistry, while not required for admission, must be elected if not previously completed.

Programs of study for new graduate students are individually developed and are based upon research interests and academic backgrounds. Students who plan to become candidates for the Ph.D. degree must in addition to the Graduate College requirements: (1) Pass a comprehensive examination and a series of cumulative examinations and demonstrate through course work a satisfactory knowledge of the subject material; (2) Demonstrate a reading knowledge of one foreign language by submitting credit for the equivalent of two years of college-level courses in which they received grades of B or better, or by satisfactorily completing a reading examination in a foreign language.

Graduate Faculty

Professors: Ludwig Bauer, Charles L. Bell, James E. Gearien.

Associate Professors: William Dunn, John F. Fitzloff, Rose Ann Grundman, Alfred von Smolinski.

Assistant Professors: Bruce Currie, Michael Johnson, Matthias Lu, Vincent Madison, Duane Venton.

Participating Staff

Associate Professor: Harlan S. McDaniel.

Assistant Professor: Michael N. Mimnaugh.

MC-325. Radioactive Isotopes. The properties and methods of detection of radiations are discussed. The use of tracers in radiobiology, medicine, and chemistry, including the applications of therapy and health physics, will be included. Prerequisite: one year of general physics. Sp. 3 qh. McDaniel, Johnson.

MC-335. Physical Chemistry. Atomic and molecular structure, chemical thermodynamics, phase equilibria, chemical equilibria, surface chemistry, electrochemistry, and chemical kinetics are discussed.

Prerequisite: one year of calculus. W. 4 qh. Madison, Bell.

MC-336. Physical Chemistry. Continuation of MC-335. Sp. 5 qh. Bell, Madison.

MC-343. Chemical Toxicology. A course concerned with the common sources, chemistry of the physiological action, methods of isolation, and identification of toxic agents commonly encountered as industrial hazards and as the cause of accidental or purposeful poisoning. Prerequisite: organic chemistry. W. 4 qh. Fitzloff, Lu.

MC-345. Chemistry of Natural Products. The occurrence, origin, biological significance, nomenclature, physical and chemical properties, methods of isolation, and pharmaceutical uses of important natural substances are studied. Prerequisites: Chemistry 113 and 123. Sp. 4 qh. Bauer, Currie.

MC-347. Organic Chemistry. This course presents an overview of all organic reactions, their mechanisms, stereochemistry, and applications in the field of medicinal chemistry. Reactions are organized according to their type, and their utilization in synthesis is illustrated from examples drawn from the contemporary literature. Prerequisite: one year of organic chemistry. F. 3 qh. Bauer, Currie.

MC-348. Organic Chemistry Laboratory. The study of organic chemistry with emphasis on techniques used in the organic chemistry laboratory. Methods not usually encountered in the basic courses in organic chemistry are stressed. Prerequisite: one year of organic chemistry. F. 2 qh. Bauer, Currie.

MC-349. Pharmaceutical Assaying. Conferences, library, and laboratory experimentation related to methods for the detection and determination of impurities as well as the major components of chemicals and medicinal products. Critical evaluations and examinations of general procedures are included. Topics include all forms of chromatography, electrophoresis, nonaqueous titrations, and E.D.T.A. titrations. Prerequisite: quantitative analysis. F. 4 qh. von Smolinski, Fitzloff.

MC-358. Drug Design. The physical and chemical factors to be considered in the rational design of potential biologically active compounds will be discussed. Topics include the relationship of potency to chemical structure, disposition of drugs in tissue, detoxification, and mechanism of action will be discussed. Sp. 4 qh. Dunn, Lu, Fitzloff, Gearien.

MC-409. Special Topics in Analytical Chemistry. Discussions and laboratory exercises designed to include newer methods of analytical chemistry. They will include microbiological methods, electrochemical methods, and chromatographic procedures. W. 5 qh. von Smolinski, Fitzloff.

MC-413. Naturally Occurring Bases of Medicinal Value. The structures of natural products as determined by degradation and synthesis are discussed as well as the biogenetic pathways by which they are formed *in vivo*. Particular attention is directed to compounds of medicinal interest such as alkaloids and selected antibiotics. Sp. 3 qh. Bauer.

MC-416. Chemical Aspects of Drug Metabolism. A study of structure-activity correlations among substrates for drug metabolizing enzymes with special emphasis on the use of theoretical models for prediction of substrate activity. Mechanisms of the chemical transformation of drugs will be discussed. Methods of analysis of drug metabolites in biological materials will be evaluated and the use of modern instrumental methods will be stressed. Prerequisite: biological chemistry. Sp. 3 qh. Lu, Fitzloff, Mimnaugh.

MC-450. Principles of Medicinal Chemistry. Basic chemical and physical principles necessary for an understanding of drug action are discussed. These principles are applied in the design of medicinal agents. Prerequisites: one year undergraduate organic chemistry and biochemistry. F. 4 qh. Gearien, Venton, Fitzloff, Lu, Currie.

MC-451. Energy Changes and Rate Processes in Medicinal Chemistry. Physical principles necessary for understanding of energy changes and rate effects in biological systems are presented. Specific application of these principles to problems relating to drug action in biological systems is discussed. Prerequisite: physical chemistry. Sp. 3 qh. Madison, Bell.

MC-452. Spectroscopy in Medicinal Chemistry. Fundamental principles and applications of spectroscopy to structure and conformation of medicinal agents, and to the analysis of dynamic biological processes. Prerequisite: physical chemistry or consent of instructor. Sp. 3 qh. Bell, Venton, Johnson.

MC-453. Theoretical Medicinal Chemistry. Theoretical aspects of drug-receptor interactions and drug design are discussed. Inter- and intra-molecular interactions fundamental to medicinal chemistry are stressed. Prerequisite: one year of organic chemistry or consent of instructor. F. 3 qh. Dunn.

MC-454. Experimental Techniques in Medicinal Chemistry. Laboratory experiments involving a variety of techniques and instrumentation used in research in medicinal chemistry. Isolation, purification, and identification of medicinal agents and their metabolites from biological systems, determining rate of metabolite formation, interaction of medicinal agents with macromolecules, quantitation of medicinal agents in biological systems and correlation of concentration and activity. Su. 3 qh. Fitzloff and Staff.

MC-455. Stereochemical Aspects of Medicinal Chemistry. The static principles of stereoisomerism and the stereodynamic aspects of chemical processes are correlated with the geometry of biologically active molecules and with their possible interactions with biological systems. Prerequisite: one year of organic chemistry, or consent of instructor. W. 3 qh. Lu.

MC-456. Advanced Medicinal Chemistry. Emphasis is placed on the biological importance of organic chemistry providing a contrast between model chemical reactions and their enzymatic counterparts. Heterocyclic chemistry and bioorganic mechanisms are covered. Prerequisites: MC-347 and MC-455 or equivalent. W. 4 qh. Currie, Lu.

MC-491. Seminar in Medicinal Chemistry. F, W, Sp. 1 qh. Staff.

MC-493. Research in Medicinal Chemistry. F, W, Sp, Su. 1 to 16 qh. Staff.

MC-494. Radioisotope Methodology for Biological and Chemical Research. The course will include discussion and laboratory exercises in the techniques of radioisotope methodology with emphasis on β-emitters. The course orientation will be primarily toward techniques used in medical, biological, and chemical research. Two hours lecture and four hours laboratory period each week. Prerequisites: calculus, elementary physics; biochemistry is recommended. F. 3 qh. Johnson.

MICROBIOLOGY

The graduate program in microbiology provides a solid foundation in general biochemistry and microbiology and, more specifically, in molecular and cellular biology involving immunology, bacteriology, and virology. A major feature of the upper-level graduate courses in microbiology is the tutorial method of teaching. In addition to the reading, which is ancillary to the didactic portion of the course, each student is provided with forty to fifty reprints on classical or current work. Then in a tutorial session with three or more staff members present, the students critically appraise the work. In this way students develop a deeper insight into the validity of published work and enhance their ability to think and write in the field. Usually a single session will cover four or five reprints on related subjects often with conflicting results. The students try among themselves the different concepts that each may have obtained from reading these papers. The staff provides general guidance in these discussions. All graduate students are required to serve as teaching assistants each year as part of their degree training program. With this background, a student can proceed to specialize in the area of his interest under the supervision of a departmental faculty member. Active research programs currently under investigation include: molecular and cellular immunology, molecular and cellular virology, microbial genetics, biochemical genetics, viral oncology, tumor immunology, clinical immunology, and pathogenic bacteriology and mycology. The program is designed to train individuals for careers in teaching and research positions in academic institutions, service and research positions in hospital diagnostic laboratories, as well as research positions in government or in industry.

Applicants with majors in biology and chemistry are eligible. Preference for admission is given to students who intend to complete the doctoral program. Graduate Record Examinations scores are required as part of the admission application.

For the M.S. degree candidates are required to take the following courses: MI-351, MI-352, MI-353, MI-354, MI-355, MI-356, and at least 10 hours of didactic courses in the 400 series; BC-361 and BC-362. In addition, 5 quarter hours must be earned in MI-493 and 3 quarter hours in MI-491. Medical students who have performed satisfactorily in the basic medical sciences course in microbiology and biological chemistry as part of their studies in medicine may pursue a joint program toward the M.S. degree in microbiology by taking at least two didactic courses in the 400 series, earning 35 quarter hours in MI-493 and 3 quarter hours in MI-491.

The requirements for the Ph.D. degree include courses already completed for the M.S. degree plus a minimum of 15 quarter hours of elective didactic courses in the MI-400 series; 10 quarter hours of didactic course work at the 400 level outside the department; MI-431 and/or MI-432 (4-9 hours); BC-410 or BC-411 (5 hours); 67 quarter hours of MI-493 and 9 quarter hours in MI-491. Students are expected to participate each quarter of residence in the departmental seminars. Students with or working for an M.D. degree may use their basic medical science courses to fulfill the 300-level microbiology and biological chemistry course requirements. M.D.-Ph.D. students must take 13 hours of 400-series courses in other departments and 20 hours of 400-level courses in microbiology. The thesis must be of sufficient merit to warrant publication in a recognized scientific journal.

Graduate Faculty

Professors: Burton Andersen, Truman O. Anderson, Peter Baram, Sheldon Dray, Henry Gewurz, Paul Heller, Olga M. Jonasson, Newton Khoobyarian, Katherine L. Knight, Arthur Kroeger, Leon J. LeBeau, Robert W. Pumper, Tawfik Y. Sabet, Stanley K. Shapiro, Pierson J. Van Alten, Edward E. Vicher (Emeritus), Lauren G. Wolfe, Mitsuo Yokoyama.

Associate Professors: Clara Bell, Lawrence A. Falk, Jr., Dario Giacomoni, W. Carey Hanly, Riaz-ul Haque, Zafar M. Iqbal, Robert L. Northrop, Harvard Reiter, Marius Teodorescu, Edward Wawszkiewicz, Abe Widra.

Assistant Professors: Barbara Marczynska, Eugene P. Mayer, Kiranur Subramanian.

Participating Staff
Professor: George Gee Jackson.
Associate Professor: Welton Taylor.
Visiting Associate Professor: Mircea Popescu.
Assistant Professors: Thomas F. Lint, David A. Peterson.
Instructors: Noel Bouck, Wayne Horng, Mark Ostro, Ken Roux.

MI-325. Microbiology and Immunology: Immunology and Host-Defense. Nonspecific and specific factors in humoral and cellular immunity; chemistry of antigens; antigens and antigen-antibody reactions; antibody formation, regulation and modification of the immune response; immediate and delayed hypersensitivity; transplantation immunity; tumor immunity; autoimmunity; immunodiffusion; complement; and immune complex disease. Sp. 3 or 5 qh. Teodorescu and Staff.

MI-326. Microbiology and Immunology: Microorganisms as Agents of Disease. Morphology, growth, nutrition, and metabolism of bacteria and viruses; sterilization and disinfection, action of antibiotics and other antimicrobial agents; microbial genetics. Systematic consideration of bacteria, viruses, fungi, and protozoa as microbial agents of disease; pathogenicity of microorganisms, immunity and resistance, immunological mechanisms of disease. Sp. 3 or 5 qh. Kroeger and Staff.

MI-351. General Immunology. Basic concepts and laboratory techniques in immunology. Lectures: chemistry of antigens, antibodies and antigen-antibody reactions; antibody formation, hypersensitivity, immunogenetics, autoimmunity, immunology of transplantation, immunity, immunological mechanisms of disease. Laboratory: immunization, qualitative and quantitative analysis of antigens and antibodies, isolation of immunoglobulins, preparation of pure antibodies, cellular synthesis of antibodies, *in vivo* and *in vitro* hypersensitivity reactions. W. 3 qh. Dray and Staff.

MI-352. General Bacteriology. Basic and applied techniques essential for the study of cytology, nutrition, metabolism, regulation, growth, death, dormancy, mutation, and gene transfer in microorganisms, especially bacteria. F. 3 qh. Wawszkiewicz.

MI-353. General Virology. Basic concepts and laboratory techniques in virology. Lectures: the nature of animal, plant, and bacterial viruses as it applies to their structure, as well as physical and chemical properties. Special emphasis will be placed on various host cell-virus interactions both *in vivo* and *in vitro*. Laboratory: techniques will include modern methods used in cultivation of cells and viruses and the application to isolation, identification, purification, and characterization of animal viruses. W. 3 qh. Khoobyarian, Popescu, and Staff.

MI-354. Molecular Aspects of Microbiology. Basic concepts of microbial and bacteriophage genetics; gene structure and function; chemical and physical properties of RNA and DNA; regulation of protein synthesis; molecular aspects of mutation, evolution, and differentiation. F. 3 qh. Mayer and Staff.

MI-355. Methods in Immunology and Virology. Methodology involving the isolation, assay, and purification of antibodies and antigens, as well as *in vitro* methods involved in hypersensitivity and transplantation; cultivation of cells and viruses and the application of these methods in isolation, identification, characterization, and purification of animal viruses. Prerequisite: undergraduate degree in biology or chemistry and/or consent of instructor. W. 2 to 4 qh. Pumper, Horng, and Staff.

MI-356. Methods in Bacteriology and Molecular Biology. Basic and applied techniques essential for the study of cytology, nutrition, metabolism, regulation, growth, death, dormancy, mutation, and gene transfer in microorganisms, especially bacteria. F. 2 to 4 qh. Haque, Giacomoni, and Staff.

MI-360. Teaching Workshop in Microbiology. Guided experience in teaching microbiology to medical students in a laboratory-discussion setting. Teaching assistants participate in the development, teaching, and evaluation of the outcomes of laboratory-discussions in a course of microbiology for medical students. Prerequisites: MI-351, MI-352, or MI-353 or MI-325 and MI-326. Sp. 5 qh. Vicher.

MI-401. Immunochemistry. Chemistry of antigens, antibodies, and antigen-antibody reactions; application of immunochemistry to biological problems. Prerequisites: MI-351 thru MI-356, biological chemistry, or consent of instructor. F. 5 qh. Knight, Friedenson, and Staff.

MI-402. Immunobiology. Biology of immunocompetent cells, antibody formation, immunity, hypersensitivity, autoimmunity, tumor immunology, and transplantation immunity. Prerequisites: MI-351 thru MI-356, or consent of instructor. W. 5 qh. Baram and Staff.

MI-403. Advanced Virology. Biological and biochemical aspects of viruses; mechanisms of viral synthesis; pathogenesis at the cellular and host levels, interferon and interference; genetics of animal and bacterial viruses. Prerequisites: MI-351 thru MI-356, or consent of instructor. Sp (to be offered in 1979). 5 qh. Staff.

MI-404. Medical Mycology. Lectures, conferences, and laboratory work covering general, opportunistic, and the pathogenic fungi which cause superficial and systemic infections in man. The immunology, pathology, laboratory diagnostic procedures, chemotherapy, morphology, and biochemical reactions of the medically important fungi will be considered in detail. Su. 2 qh. Widra.

MI-405. Medical Virology. An advanced virology course in which the latest theoretical and practical concepts of human pathogenic viruses and their relation to disease and diagnosis is considered. Prerequisites: MI-351 thru MI-356. F. 5 qh. Pumper.

MI-406. Medical Immunology. This course reviews the role of the immune processes in health and disease, and their applications to current medicine. Prerequisites: MI-351 thru MI-356. F. 5 qh. Gewurz, Yokoyama.

MI-407. Oncogenic Viruses. Oncogenic viruses, viruses producing leukemia, papillomata, and specific or generalized neoplastic diseases. Prerequisites: MI-351 thru MI-356. Sp. 5 qh. Wolfe, Falk, and Staff.

MI-408. Immunogenetics. Genetic control of soluble and cellular antigens in microorganisms, drosophilae, and mammals. Immunogenetics in reproduction and differentiation, histocompatibility, transplantation, and tolerance. Prerequisites: MI-351 thru MI-356, or consent of instructor. W. 5 qh. Hanly, Knight, Dray.

MI-430. Medical Bacteriology. A lecture, seminar, and laboratory course in the principles, theory, and practice of diagnostic microbiology. Nutrition and inhibition as factors in design of isolation media; biochemical and genetic approach for characterization of bacteria; serological techniques in the specialization of bacteria; microtechniques in diagnostic microbiology; validity and reliability levels in antibiotic sensitivity testing; quality control in diagnostic bacteriological work. Prerequisites: MI-351 thru MI-356. Su. 5 qh. Vicher, LeBeau.

MI-431. Bacterial Genetics. A lecture and tutorial course on understanding the genetics of bacteria and bacteriophage. Structure and functions of bacterial nucleus, chromosomes, genes, gene replication variation, mutation, transformation, transduction, conjugation, bacteriophage-host relationships, lysogeny, transfer of episomes and plasmids, analysis of recombinants, and chromosome mapping. Course includes critical evaluation of classical and current literature in tutorial sessions. Prerequisites: MI-351 thru MI-356, course in biological chemistry, or consent of instructor. W. 5 qh. Reiter.

MI-433. Bacterial Physiology. A lecture and tutorial course on the physiology and metabolism of bacteria. Nutrition, mechanisms of permeability, enrichment cultures, energy metabolism, respiratory enzymes, aerobic and anaerobic respiration, phototrophic and chemotrophic bacteria, metabolism of carbon and nitrogen compounds, fixation of carbon dioxide, growth and synchronization of cell division, synthesis and release of virulence factors of bacteria, sporogenesis and germination. Course includes critical evaluation of classical and current literature in tutorial sessions. Prerequisites: MI-351 thru MI-356, course in biological chemistry, or consent of instructor. W. 5 qh. Wawszkiewicz.

MI-434. Mechanisms of Pathogenesis in Microbial Diseases. The course is designed to provide the student with a working knowledge of the known and postulated mechanisms of pathogenicity of microbial infections. It covers at length the normal physiological, anatomic, cytological, and immunological host factors as they are involved in coping with, and responding to, microbial cells and their physiological functions in terms of primary and secondary infection and superinfection. Bacterial, mycoplasmal, rickettsial, viral, fungal, and protozoan diseases are included. Prerequisites: MI-351 through MI-356. W. 5 qh. Vicher, Haque.

MI-491. Seminar in Microbiology. Presentation of topics of current interest in microbiology by guest scientists, faculty, and students. Journal and research progress reports. Sections: (a) Immunology; (b) Oncology and Molecular Biology; (c) Medical Microbiology. F, W, Sp. 1 qh. Dray and Staff.

MI-493. Research in Microbiology. Individual research on problems in immunochemistry, immunobiology, immunogenetics, virology, bacteriology (genetics and metabolism), and mycology. F, W, Sp, Su. 1 to 16 qh. Staff.

NURSING SCIENCES

The M.S. degree program in nursing is built on the baccalaureate program and, in turn, provides the base for the doctoral program in nursing. The M.S. program includes a firm base in research and prepares specialists in nursing. The Ph.D. program emphasizes theory development and research.

Specialization is offered in the following areas:

- Maternity-nurse midwifery
- Medical-surgical nursing
- Nursing service administration
- Pediatric nursing
- Psychiatric (community mental health) nursing
- Public health (community) nursing

In addition to specialization in these areas, students may prepare for careers in teaching or management. They may take further work related to research or a specialty area. At the doctoral level the emphasis is upon preparation in research in these areas of nursing.

Medical-surgical nursing and public health nursing are offered on the Peoria campus. Program offerings and course descriptions are the same as those described herein under those programs, except that courses are offered at different times of the year in accordance with the needs of the area and the availability of the staff. Course offerings are scheduled annually by the Department of Nursing in Peoria and students are advised to inquire directly to the department there regarding the schedule.

The program is fully accredited by the Council of Baccalaureate and Higher Degree Programs of the National League for Nursing.

Additional Admission Requirements

- Completion of an accredited baccalaureate degree program with an upper division major in nursing.
- Licensure to practice as a professional nurse in at least one political jurisdiction.
- A personal interview with a graduate faculty member in the area of study selected.

Applicants are advised to consult with faculty in an area of interest about further experience requirements for admission.

Financial Assistance

Several sources of financial aid are available, including a limited number of traineeships. In addition, some study-work programs are available for students admitted to the program. Address all questions about financial aid to:

College of Nursing, Graduate Program
University of Illinois at the Medical Center
P.O. Box 6998
Chicago, Illinois 60680

Degree Requirements

Candidates for the M.S. degree shall fulfill requirements of the:

- Graduate College. (See section V-2.)
- Department of Nursing Sciences. (This includes a core of statistics, nursing research design, a seminar in nursing, and a minimum of 60 quarter hours.)
- Division. (See Areas of Specialization for additional requirements.)

Study Program — Minimum Requirements for the M.S. Degree in Nursing:

Formal Courses	
In major (area of specialization)	15 to 20 quarter hours
*In collateral courses	11 to 18 quarter hours
Independent research	10 quarter hours
Seminars and electives	22 quarter hours
Total	60 quarter hours

An acceptable thesis
Pass a final examination

At the completion of 48 quarter hours of satisfactory graduate work, including 15 quarter hours in the major, 10 quarter hours of independent research, 11 quarter hours of collaterals, and 12 quarter hours of seminars and electives, a student may petition to bypass the master's degree and formally pursue a program toward the Ph.D. degree. Students' petitions will be considered by the Admissions Committee.

Graduate Faculty (General)

Professors: Etta Anne Hincker, Lois J. Malasanos, Sabath F. Marotta, Agnes Rezler, Harriet Werley.
Associate Professor: Janet S. Moore.
Assistant Professors: Elizabeth Burns, MaryBeth T. Buschmann, Alice Dan, Frederick J. Kviz, Minu K. Patel, Paul Reichelt.

Participating Staff

Assistant Professor: Kathleen Knafl.

NS-350. Conceptual Models for Family Study. Family theories from sociology, anthropology, and psychology will be examined. Structural, developmental, and interaction theories will be explored as bases for understanding normal family roles and functioning. Prerequisite: consent of instructor. F, W, Sp, Su. 3 qh. Staff.

NS-395. Intermediate Statistics. Emphasis is on selection, application, and interpretation of statistical techniques appropriate for nursing research. Topics include probability, point and interval estimation, tests of hypotheses for univariate and bivariate distributions, multiple regression, partial correlation, and one-way analysis of variance. Prerequisites: NU-296 or equivalent and consent of instructor. F, W. 3 qh. Patel.

NS-400. Cells and Tissues in Disease. Combined study of normal structure and functions followed by pathohistological manifestations of a disease state coupled with appropriate interventions of treatment and care correlated in depth at the level of cells and tissues, including possible research problems. Prerequisites: AN-342, PA-325, PY-369 or PY-370, or consent of instructor. W. 3 qh. Buschmann.

NS-410. Nursing Research Design.* Research methods appropriate to the investigation of nursing problems are examined. The evolution of small-scale nursing research projects is followed from problem development through the reporting of results. Prerequisites: NU-296 or consent of instructor. F, W. 3 qh. Staff.

NS-411. Advanced Nursing Research Design.** In-depth analysis of research design, including such areas as sampling, data collection, and interpretation. Application of the content to nursing and related research.

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* Collaterals include core courses in statistics and research methodology.

* Required of all M.S. students in nursing.

** Required of all Ph.D. students in nursing.

Prerequisite: NS-410 or consent of instructor. F. 3 qh. Reichelt.

NS-412. Measurement in Nursing Research.** Review of underlying theories of measurement and critical analysis of measurement tools in nursing and related fields. Selected techniques from behavioral and biological disciplines will be presented. Students are expected to experiment with the construction or refinement and testing of an instrument. Prerequisite: NS-411 or consent of instructor. W. 4 qh. Dan.

NS-413. Conceptual Systems of Nursing.** Analysis of extant paradigms or models of nursing and their implications for practice, administration, education, and research. Constructs and models are examined for adequacy and consistency. Course aims to refine the student's ability for critical thinking through development of structures for theory analysis. Prerequisite: doctoral standing or consent of instructor. F. 3 qh. Stevens.

NS-414. Theories for Nursing.** Analysis of theoretical approaches drawn from the natural and behavioral sciences that are applicable in nursing. Readings and discussion of selected works from sociology, psychology, anthropology, and the biological sciences. Applicability of selected concepts and constructs for nursing critically analyzed. Prerequisite: NS-413. W. 3 qh. Staff.

NS-415. Theory Development in Nursing. Focuses on theory building in nursing. Students move from analysis of nursing models to development of their own models. Development includes theories for generalized or specialized areas of nursing. Evolved models are examined in light of their efficacy for research, education, and practice. Prerequisites: NS-410, NS-414. Sp. 3 qh. Stevens.

NS-420. Methods of Teaching in Nursing. Field experience in teaching nursing in classroom and clinical settings. Students will have the opportunity to develop and teach content of their clinical specialty. Supervising, counseling, and evaluating students in clinical practice settings included. Prerequisite: consent of instructor. F, W, Sp. 2 to 6 qh. Staff.

NS-440. Special Topics in Nursing. Selected topics of current interest offered as there is sufficient student demand and instructor availability. Prerequisite: consent of instructor. F, W, Sp, Su. 2 to 4 qh. Staff.

NS-451. Planned Organizational Change in Nursing. Study of the theories and process of planned organizational change. Application to selected nursing settings within the health care delivery system. Prerequisite: consent of instructor. Sp. 2 qh. Staff.

NS-452. Adult Patient Education. Examination of issues, theory, research, and practice relevant to adult patient education. Designs for assessing needs of patient subgroups and for implementing programs. Techniques for evaluation of cognitive, affective, and performance results are studied. Prerequisites: second quarter standing in a graduate or professional program; consent of instructor. Sp. 2 qh. Staff.

NS-470. Seminar: Critical Analysis of Nursing Research.** Nursing studies in selected areas of research currently in vogue are critically analyzed. Research studies are critiqued to identify facets of problems that have and have not been investigated. Prerequisite: NS-410 or consent of instructor. F. 2 qh. Staff.

NS-480. Independent Study in Nursing. Investigation of special selected problems in nursing under direction of a graduate faculty member. Modes of investigation to be determined by the nature of the selected nursing problem. Prerequisite: consent of instructor. F, W, Sp, Su. 2 to 6 qh. Staff.

NS-491. Seminar in Nursing.* Identification and analysis of a broad range of issues related to modern nursing. Topics will vary according to students' interests. Possible areas to be discussed are: distribution of health problems in the western world; adequacies and inadequacies of modern health care delivery systems; trends and directions of nursing education and nursing practice; and analysis of current research in nursing. Prerequisite: consent of instructor. F, W, Sp. 2 qh. Staff.

NS-493. Research in Nursing. F, W, Sp, Su. 1 to 12 qh. Staff.

AREAS OF SPECIALIZATION

Medical-Surgical Nursing. Medical-surgical nursing is that activity on behalf of adults with known or predicted physiological alteration and related social and behavioral problems which affect the individual's responses and/or adjustment to physiological alterations. The field of medical-surgical nursing is based on selected theories from the physical and behavioral sciences as well as medical and nursing theories. The research and practice areas for medical-surgical nursing are predominantly institutional settings, including general and specialized medical-surgical units, ambulatory care departments, and other care facilities. In addition to admission requirements of the Department of Nursing Sciences, applicants should have a minimum of one year of clinical practice as a registered nurse employed in medical-surgical nursing. Students are required to take a minimum of PY-307, NA-410, NA-411, NA-420-423 (4 quarter hours), and NA-430 (6 quarter hours), or their approved equivalents. One course in evaluation is required. Since the practitioner of advanced medical-surgical nursing functions in such roles as clinical specialist, teacher, or administrator, the student must select a study option in one of three areas: clinical subspecialization, teaching, or supervision, and fulfill 12 quarter hours in one of these areas. If a student selects more than one study option (e.g., clinical subspecialization and teaching), a minimum of six quarters would be required for completion of the program.

** Required of all Ph.D. students in nursing.

* Required of all M.S. students in nursing.

This program is also available at:

University of Illinois, Department of Nursing
123 S.W. Glendale Avenue
Peoria, Illinois 61605

Graduate Faculty

Professor: Irene B. Alyn.

Associate Professors: Mary E. Bevis, Carolyn Carlson, Felissa Cohen, Effie I. Graham, Nori Komorita, Leona Peterson, Marjorie Powers.

Assistant Professors: Margaret Grier, Mi Ja Kim.

Participating Staff

Associate Professor: Myra Levine.

Instructor: Jerry Durham.

NA-311. Acute Cardiac Nursing. Expanded responsibility of nurses in assessment and interventions for patients with acute myocardial infarction and its complications. No clinical practicum. Emphasis on concepts underlying pathophysiology, electrophysiology, dysrhythmias, and pharmacology. Prerequisite: consent of instructor. W. 2 qh. Kim.

NA-410. Analysis of Medical-Surgical Nursing Research. Analysis of selected historical and contemporary examples of research in medical-surgical nursing. Future directions for research and practice are explored. Prerequisite: consent of instructor. F, S. 2 qh. Staff.

NA-411. Psycho-Social-Cultural Theories Applied in Medical-Surgical Nursing. Selected psycho-social-cultural theories relevant to advanced practice of medical-surgical nursing. Implications of these theories for nursing interventions are analyzed. Prerequisite: consent of instructor. F, W. 3 qh. Staff.

NA-420. Clinical Conference: Medical-Surgical Nursing. Multiple sections offered in medical-surgical nursing subspecialties (e.g., cardiovascular nursing, respiratory nursing, gerontological nursing, oncological nursing, etc.). Each section will examine content of the specialty in depth. Some field experience may be required. Formation of subspecialty sections based on sufficient student demand and instructor availability. Students may register for more than one section up to 6 quarter hours. Prerequisite: consent of instructor. F. 2 to 3 qh. Staff.

NA-421. Clinical Conference: Medical-Surgical Nursing. Continuation of NA-420. W. 2 to 3 qh. Staff.

NA-422. Clinical Conference: Medical-Surgical Nursing. Continuation of NA-421. Sp. 2 to 3 qh. Staff.

NA-423. Clinical Conference: Medical-Surgical Nursing. Continuation of NA-422. Su. 2 to 3 qh. Staff.

NA-430. Methods in Medical-Surgical Nursing. Field experience in medical-surgical nursing related to clinical conferences elected in NA-420-423. Pre- or co-requisites: NA-410, NA-411, minimum of 4 quarter hours in NA-420-423, and consent of instructor. F, W, Sp, Su. 4 to 10 qh. Staff.

NA-435. Medical-Surgical Nursing Field Study. Concentrated field practice in subspecialty area in medical-surgical nursing. Emphasis on patients and families with complex nursing problems and on continued development of leadership skills in health care settings. Prerequisite: NA-430, 6 qh., and consent of instructor. F, W, Sp, Su. 6 to 10 qh. Staff.

NA-440. Special Topics in Medical-Surgical Nursing. Selected topics of current interest offered as there is sufficient student demand and instructor availability. Prerequisite: consent of instructor. F, W, Sp, Su. 2 to 6 qh. Staff.

NA-480. Independent Study in Medical-Surgical Nursing. Elective tutorial guidance in a selected area of interest. Prerequisite: consent of instructor. F, W, Sp, Su. 1 to 6 qh. Staff.

Maternity-Nurse Midwifery. Focus is upon development of detailed understanding of the normal processes of the maternity cycle, a thorough understanding of the prodromal symptoms of complications, and the relationship of these to the development and utilization of safe, effective health services for patients. Lectures, seminars, clinical experiences, and tutorial sessions are planned to enable the student gradually to assume responsibility for supervision, care, and management of the medically and obstetrically uncomplicated patient.

Graduate Faculty

Professor: Lillian Runnerstrom.

Associate Professor: Constance J. Adams.

Participating Staff

Assistant Professor: Patricia Urbanus-Dunne.

Instructors: Jane Blackwell, Sabina Dambrauskas, Sheryl Ellison, Laura Evison, Karen Gustafson, Linda Joel, Sharon Jones, Carol Lambesis, Phyllis Lesczynski, Teresa Marchese, Delores Mazarowski, Deborah Metzker, Sarah Naber, Joyce Roberts, Mary Ellen Stanton, Richard Trynda.

NB-350. History and Trends in Nurse-Midwifery. Seminar in the historical basis for current clinical specialization in maternity nursing (nurse-midwifery). Trends in the development of educational programs, legislation, and organization of services are examined in relation to the provision of care for expectant mothers and their newborn infants. Social, cultural, and demographic factors which influence the role of the nurse-midwife in the provision of care are considered. Current issues are explored. Content is derived from a review of the literature and research findings available on each topic. Prerequisite: consent of instructor. F, W, Sp, Su. 2 qh. Staff.

NB-410. Nurse-Midwifery: Antepartum/Postpartum. The study of nurse-midwifery practice during the prenatal and early postnatal stages of pregnancy. Emphasis is on assessment of departures from the expected obstetrical course and their implications for medical management. Current research findings are used as a basis for assessment and management. Prerequisite: consent of instructor. F. 4 qh. Staff.

NB-411. Nurse-Midwifery: Intrapartum. The art and science of maternity nursing and nurse-midwifery as it relates to the assumption of responsibility for supervision, care, and management of the obstetrically and medically uncomplicated patient. The focus is on an in-depth study of the normal intrapartal period, a thorough understanding of the prodromal symptoms of intrapartal complications, emergency therapy, and the implications for referral. Prerequisites: AN-360, NB-410, NB-420. Sp, Su. 4 qh. Staff.

NB-412. Nurse-Midwifery: Conception Planning and Human Sexuality. The study of nurse-midwifery practice as it relates to the supervision of normal clients during the interconceptional period with emphasis on conception planning and human sexuality. Emphasis is placed on the incorporation of research findings in conjunction with course content and on the application of research principles in the analysis of clinical problems. Prerequisite: consent of instructor. W. 4 qh. Staff.

NB-413. Advanced Maternity Nursing: The Neonate. Growth and development principles will be emphasized in a holistic approach at both the physiological and behavioral levels of analysis. The developmental tasks of the family unit and each individual member throughout the maternity cycle will be considered from the perspectives of crisis theory and the support function of the nurse-midwife. Emphasis will be given to the critical nature of the transitional newborn experiences along with the implications they may hold for life-span development. Prerequisite: consent of instructor. Sp, Su. 4 qh. Staff.

NB-420. Methods in Nurse-Midwifery: Antepartum, Postpartum. Examination of nurse-midwifery functions in conjunction with skill development through simulated clinical experiences as well as individual care of antepartal and postpartal women. Prerequisite: concurrent or following registration in NB-410. F, W, Sp, Su. 1 to 5 qh. Staff.

NB-421. Methods in Nurse-Midwifery: Intrapartum. Seminar and field experiences in appropriate maternity care settings. Nurse-midwifery functions are explored and skills developed through individual care and management of patients during labor, delivery, and postpartum. Emphasis is placed upon maintaining continuity of care and on the application of research findings in the analysis and management of clinical problems. Prerequisites: AN-360, NB-410, NB-411, NB-420. F, Sp, Su. 1 to 5 qh. Staff.

NB-422. Methods in Nurse-Midwifery: Conception Planning and Human Sexuality. Nurse-midwifery functions in the supervision and management of women's health are explored and skills developed through the individual care and management of clients. Case conferences and field experiences are integral to this course. Emphasis is placed on the application of research principles to the management of clinical problems. Prerequisites: NB-410, NB-411, or NB-412, or consent of instructor. F, W, Sp, Su. 2 to 5 qh. Staff.

NB-423. Methods in Advanced Maternity Nursing — The Neonate. Tutorial and independent experiences in a newborn nursery, a neonatal intensive care nursery, and a well child clinic. Field experiences with natural birth processes are provided when possible. Emphasis is placed on the application of research principles to the management of clinical problems. Prerequisite: concurrent or previous registration in NB-413. Sp, Su. 1 to 4 qh. Staff.

NB-424. Methods in Advanced Nurse-Midwifery Practice. A program in nurse-midwifery designed to extend and integrate the student's basic competencies in clinical practice. Course work is designed on an individual basis. A written presentation and self-evaluation of the experience is required. Tutors or preceptors will be selected and approved by the student's academic adviser. Emphasis is placed on the application of research. Prerequisites: NB-410, NB-411, NB-412, and NB-413. F, W. Sp, Su. 4 to 6 qh. Staff.

NB-440. Special Topics in Nurse-Midwifery. Selected topics of current interest such as parent education, laboratory analysis, stress during the maternity cycle, crisis intervention, and evaluation of alternate nurse-midwifery roles in the health care system, offered as there is sufficient student demand and instructor availability. Prerequisites: at least two graduate courses in the nurse-midwifery sequence and consent of instructor. F, W, Sp, Su. 2 to 4 qh. Staff.

NB-450. Management of Perinatal Complications in Nurse-Midwifery Practice. Analysis of perinatal complications with emphasis on appropriate nurse-midwifery management. Prerequisites: NB-410, NB-411, NB-412, NB-413, and related methods courses. F. 3 qh. Staff.

NB-480. Independent Study in Nurse-Midwifery. Independent investigation of special interest area of maternity nurse-midwifery. Course work is designated on an individual basis. It includes utilizations of current research and periodical literature. A written presentation and self-evaluation is required. Prerequisite: consent of instructor. F, W, Sp, Su. 2 to 6 qh. Staff.

NB-481. Independent Study — Field Experience in Nurse-Midwifery. Investigation of a special interest area in maternity nursing through individualized field experience. Emphasis is placed on the application of research principles to the management of clinical problems. Prerequisites: concurrent registration in NB-480 and consent of instructor. F, W, Sp, Su. 2 to 6 qh. Staff.

Pediatric Nursing. The purpose of the pediatric nursing option is to prepare nurses with advanced competence in nursing of sick children and their families during the phases of illness, recovery, and achievement and maintenance of health, and with competence in research. The program is concerned with the critical examination of relevant theoretical concepts in the areas of physiology, child and family development, and in the development of proficiency in its synthesis and application in clinical practice.

Applicants are reviewed for evidence of motivation and potential for professional growth. They must have had at least a year of pediatric nursing experience.

In addition to fulfillment of the general requirements of the Department of Nursing Sciences, candidates for the Master of Science degree with a major in pediatric nursing are required to complete NC-410, NC-411, NC-420, and NC-421, or their approved equivalents, and an additional approved 5 quarter hours of pediatric nursing. They may elect courses in education or administration.

Graduate Faculty
Associate Professor: Virginia Pidgeon.
Assistant Professor: Anna Tichy.

Participating Staff
Assistant Professor: Marcia Maurer.

NC-310. Theory and Principles in the Care of the High Risk Neonate. Care of the neonate focusing on the pathophysiological aberrations in the period from birth to thirty days. Incorporates major problems associated with this period such as hypothermia, hyperbilirubinemia, respiratory distress with emphasis on the latest research in the area. Prerequisites: NU-240 or equivalent and consent of instructor. F, Sp. 3 qh. Staff.

NC-330. Pediatric Nursing Assessment. Nursing assessment of the major body systems in children correlated with developmental differences in infants and children of various ages. Focuses on development of intermediate level skills with emphasis on detection and interpretation of pathology in acute pediatric care settings. F. 3 qh. Pidgeon and Staff.

NC-410. Nursing of Infants and Toddlers. Focuses on physical and psychosocial alterations accompanying illness and recovery in neonates, infants, and toddlers. Concomitant alterations in family integration, development of parenting, and family dynamics and interaction are explored. Emphasis is on application of theory and research from physiopathology, child development, and family development in resolving problems of illness and recovery. Prerequisites: PY-307 and ED-426 or concurrent registration, or equivalents, or consent of instructor. F, W. 3 qh. Staff.

NC-411. Nursing of Preschool and School Age Children and Adolescents. Focuses on physical and psychosocial alterations accompanying illness and recovery in preschool children, school age children, and adolescents. Concomitant alterations in the transition phases of parenthood and in family dynamics and interaction are explored. Emphasis is on application of theory and research from physiopathology, child development, and family development in resolving problems of illness and recovery. Prerequisites: NC-410 and NC-420 or consent of instructor. W, Sp. 3 qh. Staff.

NC-420. Methods of Nursing of Infants and Toddlers. Intensive experience with a small number of ill neonates, infants, and toddlers and their families in hospital, home, and clinic settings. Emphasis is given to identification and analysis of problems arising from physical and psychosocial alterations due to illness and concomitant alterations in family dynamics and to the development of research- and theory-based nursing approaches. Prerequisite: concurrent registration in NC-410. F, W. 3 to 5 qh. Staff.

NC-421. Methods of Nursing of Preschool and School Age Children and Adolescents. Intensive experience with a small number of ill preschool and school age children and adolescents and their families in hospital, home, and clinic settings. Emphasis is given to identification and analysis of problems arising from physical and psychosocial alterations due to illness and concomitant alterations in family dynamics and to the development of theory- and research-based nursing approaches. Prerequisite: concurrent registration in NC-411. W, Sp. 3 to 5 qh. Staff.

NC-422. Methods of Nursing the High Risk Neonate. Practicum with high risk infants focused on physical assessment of various gestational ages, application of theoretical principles in the actual care of the neonate, and generation of clinical research questions. Prerequisite: NC-310 and consent of instructor. F, Sp. 3 to 4 qh. Staff.

NC-440. Special Topics in Pediatric Nursing. Selected topics of interest such as parent counseling, parent education, advanced theory in the care of the high risk newborn, adolescent nursing, and the roles of the pediatric nurse in the health care delivery system, offered when there is sufficient student demand and instructor availability. Prerequisites: NC-410, NC-411, NC-420, and NC-421, or consent of instructor. F, W, Sp, Su. 2 to 4 qh. Staff.

NC-480. Independent Study in Pediatric Nursing. Provides opportunity to pursue independent investigation of a special interest area in pediatric nursing and concomitant field experience relevant to the problem, if desired. Course work is designed on an individual basis. A preliminary plan is required for registration. This course affords the student opportunity pragmatically to pursue a special interest area. It is often used by students to investigate and gain insight, and often expertise, in a particular aspect of their specialty area. It includes utilization of current research and periodical literature. Prerequisites: NC-410, NC-411, NC-420, and NC-421, or consent of instructor. F, W, Sp. 2 to 8 qh. Staff.

Psychiatric (Community Mental Health) Nursing. Community mental health — psychiatric nursing is that division within nursing which synthesizes and utilizes research-based principles of the natural and behavioral sciences for the purpose of fostering the continuing psychosocial biological development of individuals, families, and groups. Nursing in this area may range from the indirect services of consultation and community organization to the direct provision of psychotherapy and, additionally, to further research which will add to the theory base on which clinical practice is predicated.

The focus of the program is on the understanding and application of mental health concepts in a variety of community-based settings. The agencies used represent university, city, and state-operated facilities with diverse patient populations and treatment modalities, including hospitalization. Current theoretical constructs underlie student attainment of skills in community mental health nursing, and family therapy, courses which are required of all students. Additionally, students choose from one of three elective tracts: group psychotherapy, individual psychotherapy, or community mental health consultation/liaison. In each of these sequences, students develop preventive as well as clinical treatment and rehabilitation skills.

Graduate Faculty

Professors: Helen K. Grace, Joan M. King, Leo Levy, Gertrude A. Stokes.

Associate Professors: Pauline Bart, Louis Rowitz, Paul Singer.

Participating Staff

Assistant Professors: Marguerite Dixon, Sally Hardin, Barbara Logan, Karen Skerrett.

Instructors: Donna Ipema, Sally Lundeen, Katherine Puskar.

ND-309. Dynamics of Small Groups. Study of factors influencing effective group functioning. Special emphasis is upon group cohesion and uses of conflict, decision making, roles, and leadership. Experiential learning in class via video-taping sessions followed by examination of individual and group functioning. Additional out-of-class practice in group of student's choice. Prerequisite: consent of instructor. F, W, Sp. 3 qh. Stokes and Staff.

ND-400. Systems of Social Development. Selected aspects of human behavior are analyzed from three research and theoretical perspectives: sociobiological, psychological, and developmental. Emphasis is given to typical behavior and to concepts of deviance as the basis for nursing assessment and intervention. Prerequisites: 200-level psychology course, 300-level sociology course, and/or consent of instructor. F. 2 qh. Staff.

ND-401. Theoretical Approaches to Family Therapy. Theories which explain dysfunctional families and provide the basis for psychotherapeutic intervention by community mental health nurse practitioners are explored. Styles of intervention are analyzed according to their related theoretical perspectives. Clinical data provided by students are examined. Prerequisites: NS-350, ND-400, and consent of instructor. W. 5 qh. Staff.

ND-406. Theoretical Basis for Community Mental Health Nursing. Social systems, change, and relevant cultural theories are examined as a basis for analysis of communities and their health systems with emphasis on factors influencing residents' mental health. Application and integration of theories are demonstrated by assessment of a designated community as relevant to community mental health nursing practice. Prerequisites: 300-level sociology course, ND-309, and/or consent of instructor. F. 4 qh. Staff.

ND-423. Theoretical Approaches to Individual Psychotherapy. Individual human behavior is examined in light of theories of abnormality and deviance. Concepts and strategies basic to individual psychotherapy and the facilitation of client change or adaptation are explored. Clinical data for discussion drawn from student field experiences. Prerequisites: ND-400, or equivalent, and consent of instructor. W. 5 qh. Staff.

ND-424. Theoretical Approaches to Group Psychotherapy. Analysis of selected theories and concepts which underlie group psychotherapy. Specific psychotherapeutic skills in group intervention developed and examined in light of data drawn from student field experiences. Special emphasis placed on principles of group composition and early phases of group development. Prerequisites: ND-309, ND-400, or equivalent, and consent of instructor. W. 5 qh. Staff.

ND-425. Theoretical Approaches to Community Mental Health Consultation/Liaison. Concepts of community mental health consultation and the consultation process examined in depth from different theoretical perspectives. Techniques appropriate for case consultation, community and hospital consultation identified, developed, and tested by students. Emphasis on the development of skills in the consultation process as problem solver with individuals and in planned change within social systems. Prerequisites: ND-400, or equivalent, and consent of instructor. W. 5 qh. Staff.

ND-431. Family Therapy I. Critical analysis of concepts basic to family psychotherapy. Development and application of intervention strategies designed to promote positive change in family members. Focus on termination and/or referral. Prerequisite: ND-401. Sp. 2 qh. Staff.

ND-432. Family Therapy II. Advanced practice of family psychotherapy. Critical examination of clinical data drawn from student experiences in family psychotherapy. Focus is on brief and emergency family intervention. Prerequisite: ND-431. F, Su. 2 qh. Staff.

ND-433. Individual Psychotherapy. Continuation of ND-423. In-depth analysis of theory-based strategies of individual psychotherapy. Development of specific psychotherapeutic skills facilitated through ongoing analysis of concurrent field experiences. Special emphasis on working-through and termination phases. Both short-term and long-term modalities examined. Prerequisites: ND-423 and consent of instructor. Sp. 3 qh. Staff.

ND-434. Group Psychotherapy. Continuation of ND-424. In-depth analysis of theory-based strategies for group psychotherapy. Specific psychotherapeutic skills in group intervention developed and examined in light of presentation of data drawn from student field experiences. Special emphasis on group problems and termination process. Prerequisites: ND-424 and consent of instructor. Sp. 3 qh. Staff.

ND-435. Community Mental Health Consultation/Liaison. Continuation of ND-425. Definition of problem areas in the consultation process and identification and development of effective modes of consultant intervention. Discussion focuses on presentation of data drawn from student experiences during the consultation process. Continued development of community mental health nursing consultation theory. Prerequisites: ND-425 and consent of instructor. Sp. 3 qh. Staff.

ND-440. Special Topics in Community Mental Health Nursing. Selected topics of current interest offered as there is sufficient student demand and instructor availability. Prerequisites: ND-400, ND-452, and consent of instructor. F, W, Sp, Su. 2 to 4 qh. Staff.

ND-455. Community Mental Health Nursing I. Role theory, crisis theory, and community mental health concepts are examined as a basis of analyzing the dimensions of the community mental health care delivery system. Current and potential functioning of various community mental health practitioners are explored. Roles of the nurse in primary, secondary, and tertiary prevention are examined in detail. Prerequisites: ND-406 and consent of instructor. F. 2 qh. Staff.

ND-456. Community Mental Health Nursing II. Alternative definitions of the community mental health nurse's roles are developed and analyzed in relation to theories of nursing, mental health, and community organization. Emphasis placed on unique and future roles of the community mental health nurse. Prerequisites: ND-455 and consent of instructor. Sp. 2 qh. Staff.

ND-480. Independent Study in Community Mental Health Nursing. This course allows for individual investigation of special problems in community mental health nursing under general direction of a senior faculty member. F, W, Sp, Su. 2 to 6 qh. Staff.

Public Health (Community) Nursing. The graduate course offerings in public health nursing are intended for professional nurses desiring specialty preparation in the practice of nursing associated with community-based health programs. Research is an integral component of specialty preparation. The prime focus of course offerings is on the processes of assessment and evaluation with the purpose of determining nursing actions for promoting health and preventing illness. The study of nursing interventions is directed to communities, families, and various population groups, and to individuals as their health state is affecting, or is affected by, the community, family, or a special population group. Upon completion of the course of study, students are prepared for specialty practice in public health nursing and are able to carry out systematic investigation of nursing and community health practices.

The curriculum is designed to permit students to elect a program of study congruent with their individual career goals. Since leadership in public health nursing requires practitioners to function as clinical experts, administrators/supervisors, and teachers, the student elects a study option which conforms to one of these roles. A variety of clinical study options is available, two of which are: specialty preparation as a community nurse specialist and specialty preparation as a family nurse clinician.

This program is also available at:

University of Illinois, Department of Nursing
123 S.W. Glendale Avenue
Peoria, Illinois 61605

Graduate Faculty

Professors: Wadie Kamel, Virginia M. Ohlson, Jean M. Wood.

Associate Professors: Shu-Pi C. Chen, Gertrude Hess, Elaine C. Smith (Peoria).

Assistant Professors: Cecilia Dawkins, William Holzemer, Elizabeth Shine.

Participating Staff

Assistant Professors: Judith Cattron (Peoria), Linda Farrand, Robah Kellogg (Peoria), Eunice C. Kelly, Joanna Schleutermann, Geneva Tulga (Peoria), M. A. Zarif.

Instructors: Violet Barkauskas, Lydia Dantes, Ric Gudell, Cynthia Hendriksen, Mary Jane Klinger, Arlene Miller, Elizabeth White.

NE-370. Primary Care: Health Assessment. Designed to help the student synthesize and apply concepts, principles, and skills used in the comprehensive health assessment of individuals. Methods of health history taking and physical examination are studied and applied in activities with well and ill clients. Prerequisite: consent of instructor. F, W, Sp. 6 qh. Farrand, Miller, and Staff.

NE-411. Models of Community Assessment for Public Health Nursing Practice. Designed to examine theoretical and substantive issues relating to the concept of community health and health organizations. Various methods for assessing a community are examined to identify health needs and wants of a community which have relevance for public health nursing programs. Prerequisites: upper-division sociology, HA-300 or concurrent registration, or consent of instructor. F. 3 qh. Dawkins and Staff.

NE-412. Theories for Public Health Nursing Practice with Families and Community Groups. Focuses on public health nursing practice with populations of families and other groups. Selected psychosocial theories and conceptual frameworks for family study are examined in relation to research findings on the natural history of health problems. Seminar discussions are directed toward the development of conceptual models appropriate to the planning and implementation of nursing practice for community health. Prerequisite: NE-411. W. 3 qh. Wood and Staff.

NE-413. Theories for Program Evaluation in Community Health Nursing Practice. Explores current concepts and issues relating to program evaluation. Focuses on public health nursing programs as they relate to community health status, program effectiveness, and patient outcomes. Selected evaluation theories and models are examined in light of their application to public health nursing practices. Prerequisite: NE-412 or consent of instructor. Sp. 3 qh. Chen and Staff.

NE-421. Community Assessment Methods. Designed to provide the opportunity for students to experiment with methods of gathering data on a community. Communities and health agencies provide the settings for practice. Based on the concepts presented in NE-411, students formulate and implement a plan for assessing a community's health and related needs. Prerequisite: concurrent registration in NE-411. F. 3 qh. Dawkins and Staff.

NE-422. Methods for Family and Community Health Care. Provides opportunities for students to apply and experiment with methods for implementing public health nursing practice with groups of families and other populations. Faculty guided seminar sessions facilitate students' identification of health problems among families and other populations at risk, and planning public health nursing interventions. Prerequisites: NE-421 and concurrent registration in NE-412. W. 3 qh. Wood and Staff.

NE-423. Program Evaluation Methods. Evaluation methods commonly employed by community nursing agencies are examined. Based on content presented in NE-413, students apply evaluation methods in the study of community nursing programs. Community agencies provide settings for practice. Prerequisites: NE-422 and concurrent registration in NE-413. Sp. 3 qh. Chen and Staff.

NE-430. Family Counseling Practices in Community Health Nursing. Theories of communication and concepts of counseling are studied in relation to family structure. Family interactions and communication patterns are analyzed. Issues associated with the public health nursing role in negotiating contracts for service to families are discussed. Controversial models for family counseling are examined in relation to selected aspects of public health nursing practice. Students have the opportunity to select and enter into counseling situations with families. Prerequisites: NE-421 and consent of instructor. W, Sp. 4 qh. Hess and Staff.

NE-431. Primary Health Care: Children. This course focuses on primary health care for children. Emphasis is on wellness management and the assessment, diagnosis, and management of defined health problems common to children. A growth and development framework is utilized in defining parameters of wellness and in planning health management of well children of all ages. Theory presented in conjunction with clinical application allows the student to learn in collaboration with medical and nursing faculty. Prerequisites: NE-370, PY-307 or equivalent, and consent of instructor. Sp. 6 qh. Schleutermann, Farrand, and Staff.

NE-432. Primary Health Care: Adults. Nursing practice is studied in relation to the physical and psychosocial aspects of health conditions common to adults and the aging population. Emphasis of study is on the health promotion and management of acute and chronic health problems of ambulatory clients and their families. Opportunities are provided to apply theories and methods of health assessment and management of clients with selected health conditions under the supervision of nurse and physician faculty preceptors in a variety of primary care settings. Prerequisites: NE-370, PY-307 or equivalent, and consent of instructor. F. 6 qh. Miller and Staff.

NE-440. Special Topics in Public Health Nursing. Selected topics of current interest in public health nursing offered as there is sufficient student demand and instructor availability. F, W, Sp, Su. 2 to 4 qh. Staff.

NE-450. Contemporary Issues in Public Health Nursing. Current trends and emerging issues in community health and public health nursing practice are examined in relation to the health of the population, health care delivery patterns, and the nursing profession. Prerequisite: NE-412 or NE-430. F. 2 qh. Shine and Staff.

NE-451. School Nursing: Health and Administrative Aspects. This seminar is designed to examine the current, as well as potential, role of nursing associated with school settings. Questions of health and educational jurisdiction are examined in relation to health benefits for children, their families, and the community. Health problems that may be identified and prevented through organized school health programs are studied. Prerequisites: NE-411 and HA-300. F, Sp. 3 qh. Ohlson and Staff.

NE-452. Occupational Health Nursing. Seminar designed to examine current and potential role of nursing in preventing or ameliorating health problems of adults in occupational settings. Health problems of adults specific to the environment and product of occupational settings are studied. Organized nursing programs for both large and small settings are differentiated. Legal aspects of occupational nursing are considered. Prerequisites: NE-411 and HA-300. Sp. 3 qh. Ohlson and Staff.

NE-453. Nursing in International Health. Seminar provides opportunity to explore the basis for similarities and differences in systems of nursing education, nursing services, and public health nursing practices of various countries. Examination of effects of cultural factors and political structures on practice. Opportunities for participating in cross-cultural research are explored. Sp. 3 qh. Ohlson and Staff.

NE-480. Independent Study in Public Health Nursing. Designed to permit students to elect a specific area of public health nursing practice for in-depth study. Theoretical and practical applications for study are planned by the student in consultation with a faculty member. Prerequisites: Three 400-level courses in public health nursing and consent of instructor. F, W, Sp, Su. 2 to 6 qh. Ohlson and Staff.

Nursing Service Administration. Nursing service administration is the intellectual endeavor which synthesizes the disciplines of nursing and management in order efficiently and effectively to direct the operations of the nursing services in organized health care agencies toward the realization of the goals of the nursing services and of the agencies to the end that planned patient outcomes are achieved.

The purpose of the nursing service administration program is to prepare nurses for top-level executive positions in nursing departments of organized health care agencies.

Nursing service administration requirements include the following courses or their approved equivalents: NF-402, NF-410, NF-411, NF-412, NF-420, NF-421, NF-422, NF-452; and HM-451, HM-452, and HM-453. All courses taken to fulfill requirements must be approved in advance by the academic adviser.

Graduate Faculty

Associate Professors: Margaret Ellsworth, Barbara J. Stevens.

Participating Staff

Assistant Professors: Donald Bille, Norma Chaska.
Instructor: Linda Haar, Tom Hanna.

NF-300. Principles of Administration. Overview of the principles, objectives, and methods of managing nursing services in a division of a health services institution or agency and skill training in applying this knowledge. F, W, Sp. 2 qh. Hanna.

NF-402. Fiscal Management for Nursing Services. Prepares the nursing service administrator to understand the financial systems within the health organization; to plan, prepare, and manage the nursing service budget; and to apply accounting and cost control principles to programs of the nursing department. Focuses upon basic principles of accounting; principles of budgeting; types of organizational and departmental budgets; and preparation, interpretation, and use of budgets and financial statements. Prerequisite: consent of instructor. F. 3 qh. Haar.

NF-410. Organization of Nursing Services. Examines the organization and management of nursing services in health care organizations. Theories and practices of organization and management are examined; their implications for nursing services are explored. Focus is placed on design of nursing organization so as to achieve organizational goals and purposes. Prerequisite: consent of instructor. F. 3 qh. Stevens, Haar.

NF-411. Administrative Functions in Nursing Services. Examines role and functions of the nurse executive of a health organization with emphasis on responsibility-accountability, delegation, decision making, staffing, fiscal planning, and evaluation of effectiveness. Prerequisite: NF-410. W. 3 qh. Staff.

NF-412. Staff Support Services in Nursing. Presents the substantive content of personnel and labor relations as they apply to the nursing service setting: nature and objectives of effective personnel management; staff recruitment, selection, development, and evaluation; and employee-employer relations and negotiations. Prerequisites: NF-411 or consent of instructor. Sp. 2 qh. Haar.

NF-420. Methods of Organizing Nursing Services. Design and criticism of the major operating documents required to organize a nursing service division. In group and individual work, students develop the working documents of the nursing division in a prototype health maintenance organization. Prerequisite: NF-410, or concurrent registration. F. 3 qh. Stevens and Staff.

NF-421. Methods of Administration in Nursing Services. Student observes and participates in various organizational functions such as departmental organization, budgeting, staffing, communications, and directing personnel toward goals with an administrative nurse-preceptor. Evaluates observed events according to administrative models. Prerequisites: NF-420, NF-411 or concurrent registration. W. 3 qh. Staff.

NF-422. Methods in Staff Support Services in Nursing. Laboratory and field observation in personnel and employee relations, selected health service organizations, and industrial firms; evaluation of personnel services: staff procurement, development, performance appraisal; job evaluation and payment scales; employee organizations and negotiations, employment contracts, rewards, discipline, and promotion. Prerequisite: NF-412 or concurrent registration. Sp. 2 qh. Haar.

NF-429. Methods of Management in Clinical Nursing. Guided experience in planning, organizing, and managing a division of nursing service in the student's clinical specialty. Includes opportunity to observe and participate in the supervisory role: planning a supervisory program, designing strategy for effective change and for evaluating supervisory outcomes. Prerequisite: NF-300. F, W, Sp, Su. 5 to 6 qh. Hanna.

NF-440. Special Topics in Nursing Service Administration. Selected topics of current interest in nursing service administration offered if there is sufficient demand and instructor availability. Prerequisite: consent of instructor. F, W, Sp, Su. 2 to 4 qh. Staff.

NF-450. Evaluation in Nursing Services. Explores evaluation systems used in nursing services. These systems include: quality control for patient care, program evaluation, employee performance appraisal, evaluation of inservice education, and evaluation of nursing service administration. Focus is placed on construction of evaluative tools. Prerequisite: consent of instructor. W, Sp. 3 qh. Stevens and Staff.

NF-451. Information Systems and Nursing. Orients students to the nature and requirements of modern information systems in health care agencies and prepares them to participate knowledgeably in planning and policy decisions in their agencies, to organize and instruct their nursing staff for effective and efficient implementation of electronic data processing applications, and to realize and evaluate benefits from such applications. Prerequisite: Introductory knowledge of computer technology, NS-395, or consent of instructor. F. 2 qh. Jacobs, Haar.

NF-452. Managerial Strategies in Nursing Service Administration. Facilitative thought processes for managers are considered; related managerial tools and techniques are reviewed. Selected problems of nursing service administration and alternate managerial approaches to resolution are examined in seminar discussion. Course synthesizes previous learning in the Nursing Service Administration sequence. Prerequisite: NF-412. F. 2 qh. Stevens.

NF-480. Independent Study in Nursing Service Administration. This study allows for investigation of special problems in nursing service administration under tutorial direction of a senior faculty member. Prerequisites: NF-410, NF-420. F, W, Sp, Su. 2 to 6 qh. Staff.

ORAL AND MAXILLOFACIAL SURGERY

The M.S. degree is offered in oral and maxillofacial surgery. The program is designed to provide training in research and teaching as well as a comprehensive basic science background for individuals interested in pursuing academic careers in the specialty.

The prerequisite for admission is a D.D.S. or D.M.D. degree from an accredited institution.

At least 20 quarter hours of OS-493 are required for the M.S. degree. In addition, formal courses are required, including some in pathology, anatomy, oral pathology, histology, pharmacology, physiology, or other courses suited to the individual needs of the student.

A minimum of two years is necessary to obtain the M.S. degree for students not participating in the clinical program. During this period the student is required to devote a portion of time to teaching and assisting in the department. Students in the combined didactic and clinical training program are registered in the Graduate College on a part-time basis during their four-year residency.

Individuals participating in the graduate degree program as part of the four-year oral surgery residency receive financial support from the University of Illinois Hospital and are exempt from tuition and fees.

Graduate Faculty

Professors: Daniel M. Laskin, Eugene C. Lekan, George Stadnicki.

Assistant Professor: David S. Evaskus.

OS-493. Research in Oral and Maxillofacial Surgery. F, W, Sp, Su. 1 to 16 qh. Staff.

ORAL PATHOLOGY

The M.S. degree is offered in oral pathology. The program is designed to prepare students for teaching and investigating in the field of oral pathology. It provides a knowledge of the general field of pathology.

It is not intended to prepare individuals for diagnosis of oral lesions. However, such training is available in the department in a specialty training program, and candidates with a dental degree are encouraged to undertake a combined program.

Courses required of all candidates for the M.S. degree in oral pathology include 4 quarter hours in advanced oral pathology. Opportunities for thesis research are available in the numerous laboratory disciplines practiced in the department, including biochemistry, cell and organ culture, scanning and transmission electron microscopy, and histochemistry. As part of their experience students include in their timetable some participation in departmental teaching and the study of human oral pathology.

On completion of the requirements for the M.S. degree in oral pathology students may apply for admission for work toward the Ph.D. degree in pathology. Alternatively, after satisfactory completion of 48 quarter hours of graduate study, students may be eligible to bypass the M.S. degree and proceed towards the Ph.D. degree.

Graduate Faculty

Professors: Carl Cohen, Arup K. Das, Stanley J. Gerson, Nicholas G. Grand, Herman Medak, Armen Z. Mesrobian, Julia Meyer, Samuel Pruzansky, John P. Waterhouse.

Associate Professors: Erwin P. Barrington, Muhammad Iqbal, Shu-Yung Wang.

OP-401. Advanced Oral Pathology. The course presents an analysis of the important pathologic processes as they manifest themselves in the oral cavity and adjacent regions. Prerequisites: MI-351, PA-325, course in oral pathology, course in physiology, or consent of instructor. F. 2 qh. Waterhouse and Staff.

OP-402. Advanced Oral Pathology. The course presents an analysis of the effects of the principal disease processes upon the tissues and organs of the oral cavity and adjacent regions. Prerequisites: MI-351, PA-325, course in oral pathology, course in physiology, or consent of instructor. W. 2 qh. Grand.

OP-491. Seminar in Oral Pathology. Weekly reviews, reports, and discussion of topics drawn from the literature and the material of surgical oral pathology. Sp. 2 qh. Grand, Wang.

OP-493. Research in Oral Pathology. F, W, Sp, Su. 1 to 16 qh. Staff.

ORTHODONTICS

The M.S. degree is offered in orthodontics. The program is primarily one of training for research and teaching in the basic and applied sciences in orthodontics.

Applicants usually will have the D.D.S. degree or its equivalent from an accredited dental college.

A residence of a minimum of twenty-four consecutive months (two and two-thirds academic years) is required of candidates for the M.S. degree. A minimum of 16 quarter hours of formal courses is required. Credit must be gained for all sections of RD-401 in most instances. Other requirements are met by taking AN-350, DH-401, GC-301, and other courses in the basic sciences. Additional courses may be required by the major adviser. Students must register for a full program of 12 to 16 quarter hours each quarter, part of which is met by the clinical program and clinically associated courses. These courses do not receive Graduate College credit, but are required in the orthodontic program.

Graduate Faculty

Professors: Howard Aduss, John F. Cleall, Bernard J. Schneider.

Assistant Professors: Ellen A. BeGole, Zane F. Muhl, Cyril Sadowsky.

Participating Staff

Associate Professors: Louis M. Andria, Andrew J. Haas.

RD-401. Orthodontics (Growth and Development and Function of the Craniofacial Structures). Basic and clinical concepts are discussed, as is the research methodology pertinent to the field. F, W, Sp (1st year) and F, W (2nd year). 1 to 9 qh. BeGole, Cleall, Muhl, Schneider.

RD-491. Seminar in Orthodontics. F, W, Sp. 1 to 3 qh. Staff.

RD-493. Research in Orthodontics. F, W, Sp, Su. 1 to 16 qh. Staff.

ORTHOPEDIC SURGERY

Graduate study in orthopedics is offered by the department leading to the M.S. degree. A unique opportunity exists to provide a limited number of individuals who expect to make careers of teaching and research with sound backgrounds in the related basic sciences, in scientific investigation, and in teaching.

Prerequisites are the M.D. degree and at least one year of internship.

Graduate work for the degree includes attendance at one seminar per quarter for three quarters in one of the related basic science disciplines. Among the formal 400-series courses, the following are suggested: AN-421, DH-403, MI-402, and RA-410. Attendance at staff conferences and seminars in orthopedics is also required.

Graduate Faculty

Professors: Riad Barmada, Robert D. Ray.
Associate Professor: Svante Rolander.
Assistant Professors: Edward Abraham, Boonmee Chunprapaph, Teng Liang Huang.

Participating Staff

Associate Professor: William Meltzer.

RS-491. Seminar in Orthopedics. Weekly reviews, reports, and discussions of topics related to the musculo-skeletal system. F, W, Sp, Su. 2 qh. Ray and Staff.

RS-493. Research in Orthopedics. Individual research under the direction of a staff member in the field of the biological, biochemical, physiological, physical, and pathological aspects of the musculo-skeletal system. F, W, Sp, Su. 1 to 16 qh. Staff.

PATHOLOGY

Pathology, as a graduate college discipline, offers research opportunities to students of diverse interests on the Medical Center campus leading to the M.S. and Ph.D. degrees in pathology. Additionally, the department participates in an interdisciplinary program in biology and experimental pathology (see section IV-4.1).

The objectives of pathology are to elucidate the etiology and pathogenesis of disease; to study the causative agents or underlying conditions; to contribute to diagnostic procedures; and to trace the transformation of a normal tissue or process into its abnormal morphology or function. The field of pathology is broad, as are its methods of study which may be unique to the discipline or may in part comprise those of all other basic and clinical sciences. Pathologic studies may be concerned with morphology (gross and microscopic), with biochemistry at many levels of sophistication, with biophysics, and with molecular biology, immunochemistry, and genetics.

The tracks in experimental pathology, with programs emphasizing anatomic pathology, are largely reserved for students in concomitant studies and graduates with M.D., D.D.S., or D.V.M. degrees. The tracks with basic science emphasis, including genetics and molecular biology as well as clinical laboratory pathology, are open to candidates with biology, chemistry, and technology backgrounds, as well as candidates with advanced paramedical degrees.

Career opportunities differ with the training and interests of individual students. For example, the goals of the M.D., D.D.S., or D.V.M. graduate (or prospective graduate) might comprise academic teaching, a service assignment, and research. For the medical technologist or liberal arts candidate, a goal could be advanced opportunities in laboratory medicine, teaching, and research, or any combination of these.

Active research programs are currently being conducted by members of the department in numerous areas within the department's Clinical Laboratories. Some current projects include the isolation of normal tissue and tumor-specific antigens and their characterization; response to chemotherapy of human tumor culture lines; isolation of lymphocyte subpopulations, cellular immunology, chemical carcinogenesis, and lead poisoning. In addition, there are ongoing programs in medical immunology, virology, special chemistry, and toxicology designed to train individuals for careers in teaching, research, and service work.

Graduate Faculty

Professors: Burton R. Andersen, Anatoly Bezkorovainy, Hubert R. Catchpole (Emeritus), Carl Cohen, Stanley Gerson, Cecil A. Krakower (Emeritus), Daniel M. Laskin, Leon J. LeBeau, Elie P. Leroy, Elizabeth A. McGrew, Julia Meyer, Samuel T. Nerenberg, Newton Ressler, John P. Waterhouse, Ruth L. Wong, M. Mitsuo Yokoyama.
Associate Professors: John P. Bederka, Jr., Friedrich A. O. Eckner, Robert B. Epstein, Isadore Faiferman, Robert F. Locke, Jose R. Manaligod, Reuben Matalon, Ursula F. Rowlatt, Hebert M. Yamashiroya.
Assistant Professors: Lawrence Blecka, Robert J. Buschmann, Seymon Millner.

Participating Staff

Professor: Orville T. Bailey.
Assistant Professor: Robert R. McKiel.

PA-325. General Pathology. The basic principles of pathological processes, including tissue injury and repair, inflammation, circulatory disturbances, retrograde processes, and tissue responses to specific infectious agents and neoplasms are considered. The laboratory exercises are designed to correlate and interpret the gross, microscopic, and functional changes occurring in diseased tissue. Prerequisites: anatomy, histology, biological chemistry, introductory work in microbiology and physiology. F. 5 qh. Staff.

PA-326. Organ Pathology. The disease processes affecting each organ and anatomic system are considered in greater detail in this continuation of PA-325. W. 4 qh. Staff.

PA-327. Clinical Pathology. Continuation of PA-325 with orientation toward the clinical aspects of pathology. W. 4 qh. Staff.

PA-401. Experimental Pathology. Lecture, seminar, and laboratory course in the essentials of experimental pathology. Limited to eight students. Prerequisites: undergraduate courses in pathology and anatomy, including histology. Sp. 5 qh. Manaligod.

PA-402. Histochemistry. Lecture and laboratory course in methods and results of investigation in histochemistry. Fields covered depend on interests of students and may include work with inorganic substances, carbohydrates, vitamins, hormones, nucleic acids, enzymes, and amino acids. Limited to eight students. Prerequisites: biological chemistry and histology. Sp. 5 qh. Eckner.

PA-404. Ultrastructural Pathology. Lecture and seminar in the ultrastructural pathology of kidney, gastrointestinal tract, liver, muscle, and bone. Prerequisite: general pathology. W. 3 qh. Buschmann.

PA-407. Physiological Basis of Pathology. Lecture, seminar, and laboratory course in physiological mechanisms underlying abnormal structure and function. Limited to eight students. Prerequisites: general pathology, physiology, biological chemistry, and anatomy. W. 3 qh. Staff.

PA-430. Medical Bacteriology. (Same as MI-430, q.v.) Su. 5 qh. LeBeau, Vicher.

PA-464. Recent Trends in Clinical Chemistry. Studies based upon fundamental biochemistry and current theories in the literature. The nature and variations, in health and disease, of serum proteins and serum enzymes; electrophoresis; use of enzymes as diagnostic reagents; and the role of computers in clinical chemistry; reading assignments presented and discussed. Prerequisite: course in biological chemistry. W or Sp. 1 qh. Ressler.

PA-491. Pathology Seminar. Weekly seminar covering selected fields of interest and research in pathology. F, W, Sp. 1 qh. Staff.

PA-493. Research in Pathology. F, W, Sp, Su. 1 to 16 qh. Staff.

PEDIATRIC DENTISTRY

The mission of the department is to conduct educational programs in the field of pediatric dentistry. The department has as one of its goals the preparation of qualified and interested dentists for academic careers in teaching and research in pediatric dentistry or for careers combining teaching, research, and practice. The M.S. degree is awarded to those candidates who successfully complete the graduate program, which consists of a curriculum arranged best to meet the academic objectives of the candidate while at the same time meeting the requirements of the Graduate College.

The thesis must utilize any basic science discipline yet be oriented to problems related to the field of pediatric dentistry. In addition, the candidate must successfully complete the postgraduate clinical training concurrently, which is not credited toward the degree requirements. A minimum residence of twenty-four months (eight quarters full-time) is required. Applicants who have already completed postgraduate training may complete the graduate program in twelve months (four quarters full-time).

Applicants must have a doctoral degree or equivalent from an acceptable dental school. Details concerning the program are available from the department.

Graduate Faculty

Professors: Allen W. Anderson, Raynard J. Dooley, Indru C. Punwani.
Associate Professor: Hannelore T. Loevy.
Assistant Professor: John G. Crawford.

PE-310. Principles and Methods in Dental Research. Evaluation of research methods, experiment design, and statistics used in cariology, periodontology, endodontics, malocclusion, and other areas of dental research. Su. 2 qh. Dooley.

PE-311. Principles and Methods in Dental Research. Continuation of PE-310. F. 2 qh. Anderson, Crawford.

PE-312. Principles and Methods in Dental Research. Continuation of PE-311. W. 2 qh. Anderson, Crawford.

PE-401. Dental Pediatrics. Physical, mental, and emotional growth and development are studied. Areas of special interest, such as pediatric problems in health and disease, the handicapped, metabolic disturbances, diet and nutrition, and preventive dentistry, are related to specialized dental treatment and research. F. 2 qh. Punwani.

PE-402. Dental Pediatrics. Continuation of PE-401. W. 2 qh. Punwani.

PE-403. Dental Pediatrics. Continuation of PE-402. Sp. 2 qh. Punwani.

PE-405. Dental Genetics. An advanced course designed to acquaint the dental student with the genetic basis of oral diseases and conditions. Special emphasis will be placed on syndromes of the head and neck. The course will include critical evaluation of current literature. F. 2 qh. Loevy.

PE-491. Seminar in Pediatric Dentistry. Presentation and discussion of current literature and research in pediatric dentistry and that applicable to pediatric dentistry from other areas. F, W, Sp, Su. 2 qh. Staff.

PE-493. Research in Pediatric Dentistry. F, W, Sp, Su. 1 to 16 qh. Staff.

PHARMACOGNOSY AND PHARMACOLOGY

The department offers programs leading to the M.S. and Ph.D. degrees in pharmacognosy.

The major aim in the graduate program in pharmacognosy is to educate and train qualified individuals in the sciences of pharmacognosy and natural products chemistry for career opportunities in academic teaching and research, as well as research positions in government, in industry, and in private research institutes.

In the pharmacognosy program the phytochemical, biochemical, and biological aspects of natural products are emphasized. The major research effort is concerned with the isolation, identification, and structure elucidation of plant constituents having biological activity. Other areas of pharmacognostical research include biotransformation and qualitative and quantitative analyses of natural products.

Qualified students lacking Pharmacognosy 232 and 233, Pharmacology 241, 242, and 243, or their equivalent may be admitted but will be required to remedy their deficiencies early in their graduate programs.

Candidates for the M.S. degree must complete not less than 23 quarter hours and candidates for the Ph.D. degree not less than 40 quarter hours of formal core courses. All degree candidates are required to participate in undergraduate teaching, in order properly to prepare them for careers that might require their participation in formal or informal teaching duties.

Graduate Faculty

Professors: Norman R. Farnsworth, Harry H. S. Fong, Edward S. Mika, Ralph W. Morris, Elmore H. Taylor.

Associate Professors: Philippe S. Benoit, Audrey S. Bingel, Geoffrey A. Cordell, Norman L. Katz, Emmanuel B. Thompson.

Assistant Professors: Hemendra Bhargava, Robert Dobberstein, A. Douglas Kinghorn.

Participating Staff

Assistant Professors: Donald Waller, Robert O. Warwick.

PP-303. Chemotaxonomy. A consideration of the systematic classification of plants based on the distributional correlations of certain well defined secondary phytoconstituents and existing taxonomic plant groupings. The course will be based on current literature, and student participation in extensive library work will be required. Prerequisite: PP-305 or equivalent. F (to be offered in 1979). 4 qh. Fong.

PP-305. Plant Taxonomy. Classification, identification, collection, preparation of plants having medicinal or potential medicinal use. Major taxonomic systems and herbarium procedures will be discussed. Prerequisite: undergraduate course in principles of pharmacognosy. Su (to be offered in 1979). 5 qh. Farnsworth.

PP-307. Phytoscreening. A course designed to allow the student effectively to evaluate small plant samples for the presence of specific groups of chemical compounds. Prerequisites: undergraduate organic chemistry and pharmacognosy, and permission of instructor. Su (to be offered in 1979). 3 qh. Farnsworth.

PP-311. Drug Bioscreening. Drug screening procedures will acquaint the student with certain basic pharmacologic techniques in scanning and evaluating chemical compounds of natural and synthetic origin for their qualitative effects. Emphasis is placed on setting up of preparations, testing, analysis of data, and evaluation of the potential value of unknown drugs. Prerequisite: undergraduate pharmacology. W. 5 qh. Thompson.

PP-360. Microscopy of Natural Drug Products. The use of microscopic methods in the identification of drugs, both natural and crystalline synthetic. Determination of drugs, including the use of the light microscopic, polaroid, phase contrast, and darkfield illumination. Prerequisite: PP-233, or consent of instructor. W. 4 qh. Mika.

PP-369. Predictive Strategy in Pharmacognosy. Consideration of the methods used for the selection of plants that are most likely to yield biologically active compounds will be presented through lectures and discussions. Prerequisites: PP-232 or completion of equivalent course work as determined by the instructor. 3 qh. Farnsworth.

PP-401. Drug Plant Cultivation. A consideration of the principles involved in the propagation and care of drug plants, combined with practical applications at the Pharmacognosy and Horticulture Field Station. Attention is given to the principles and practice of harvesting, preparation, storage, and marketing. Su (to be offered in 1979). 5 qh. Mika.

PP-410. Pharmacognosy Research Techniques. A lecture and laboratory course in the analysis of organisms and their products important to pharmacognosy, including the biological and chemical nature of constituents. Qualitative and quantitative aspects of chromatographic, spectrophotometric, gravimetric, and volumetric determinations of the natural products will be presented. Prerequisite: consent of instructor. F. 5 qh. Dobberstein.

PP-411. Advanced Pharmacognosy I. A theoretical and applied course designed to acquaint the student with the occurrence, isolation, characterization, identification, and biosynthesis of biologically active or potentially active natural products. Prerequisites: PP-232, PP-233, PP-410, MC-325, or equivalents, or permission of instructor. W. 4 qh. Cordell, Dobberstein.

PP-412. Advanced Pharmacognosy II. Continuation of PP-411 with emphasis on nonnitrogenous compounds. Prerequisite: PP-411. Sp. 4 qh. Cordell, Dobberstein.

PP-413. Advanced Pharmacognosy Laboratory. A laboratory course designed to enable the student to apply the theoretical knowledge gained in PP-411 and PP-412 to solving isolation and biosynthetic problems through practical experiences. This course extends over three academic quarters. Prerequisite: concurrent registration in PP-411. W, Sp, Su. 4 qh. Cordell, Dobberstein.

PP-415. Structure Elucidation of Natural Products. The course is designed to bring together the student's knowledge of spectroscopy, organic chemistry, stereochemistry, and heterocyclic chemistry and apply it to the elucidation of the structures of natural products. Prerequisites: PP-410, MC-347, MC-451, or permission of instructor. F (to be offered in 1978). 4 qh. Cordell.

PP-440. Special Topics in Pharmacognosy (e.g., Ethnopharmacology Field Work; Recent Advances in Pharmacognosy; Fermentation and Biotransformation of Natural Products). F, W, Sp, Su. 2 to 4 qh. Staff.

PP-491. Seminar in Pharmacognosy. F, W, Sp. 1 qh. Staff.

PP-493. Research in Pharmacognosy. F, W, Sp, Su. 1 to 16 qh. Staff.

Supporting courses may be chosen from the following: BC-361, BC-362; MC-325, MC-345, MC-347, MC-401, MC-402, MC-403, MC-408, MC-410, MC-494; MI-325; PM-431; and PL-325, PL-326, PL-493.

PHARMACOLOGY

Pharmacology is the science which deals with the qualitative and quantitative aspects of the effects of chemical compounds upon the living organism. Specialized training is offered at the molecular as well as at the clinical level, and includes studies of drug metabolism, effects of drugs on the peripheral nervous system, brain, behavior, cardiovascular system, intermediary metabolism, and enzyme systems of experimental animals and of man.

Preference is given to applicants who have completed undergraduate majors in biological sciences or chemistry and who are interested in teaching and research careers in the medical sciences.

The study of pharmacology requires a thorough knowledge of chemistry, biochemistry, and physiology. Depending upon the area of research specialization, competency in microbiology, anatomy, biophysics, or pathology may be required. Accordingly, the programs in pharmacology leading to the M.S. and Ph.D. degrees require broad training in basic medical sciences as well as advanced courses in pharmacology. The curriculum is designed to train candidates for teaching in medical schools and for research in university, industrial, and governmental laboratories.

The thesis for the doctorate should be of such merit as to warrant publication, in part or in full, in a recognized scientific journal. Participation in the teaching of laboratories, conferences, and seminars is part of the curriculum of all degree candidates.

Graduate Faculty

Professors: Edmund G. Anderson, Harold Feinberg, Sidney Levitsky, Tadeusz J. Marczynski, Everett W. Maynert, Martin P. Schulman, Theodore R. Sherrod.

Associate Professors: Phyllis H. Bogner, Richard D. Green, Lawrence Isaac, Miodrag Radulovacki.

Assistant Professors: Michael Evans, Judith C. Kusek, Guy LeBreton, Richard A. Levy, Herbert K. Proudfit.

PL-325. Pharmacology I. The physiochemical basis of drug action: absorption, distribution, metabolism, and excretion; dose-response relationships; receptor theory; drug-membrane interactions; selective toxicity. Drugs affecting peripheral, autonomic, and central nervous systems; cardiovascular and renal pharmacology; pharmacology of endocrine and gastrointestinal systems; blood and blood-forming organs and autocoids. Chemotherapy, vitamins, toxicology; drug allergy and idiosyncrasy; physical dependence; drug evaluation. Prerequisites: biological chemistry, human physiology, or equivalents. Sp. 5 qh. Staff.

PL-326. Pharmacology II. Continuation of PL-325. Prerequisites: biological chemistry, human physiology, or equivalents, and PL-325. F. 5 qh. Staff.

PL-402. Biochemical Mechanisms of Drug Action. Discussions of the kinetics of enzyme action and the role of drugs as inhibitors and activators of components of multi-enzyme systems, as well as of specific enzymes. Advances in chemotherapy of neoplasia, antibiotics, and action of chemical mediators are in terms of analog inhibitors and enzyme-substrate interactions. Vitamins and hormones are discussed as cofactors for reactions and as control mechanisms for reaction sequences. Prerequisites: PL-325, PL-326, or equivalent. W (to be offered in 1979). 2 qh. Schulman, Maynert, Foreman, Kusek.

PL-405. Advanced Topics in Cardiovascular and Renal Pharmacology. Drug action on the cardiovascular system and kidneys, with special emphasis on the failing heart, cardiac arrhythmias, electrolytes and the heart, and renal hemodynamics as influenced by drugs. Prerequisites: PL-325, PL-326, or equivalent. Sp (to be offered in 1979). 2 qh. Sherrod.

PL-406. Advanced Topics in Psychopharmacotherapy. A multidisciplinary approach to explore current views and developments in the area of pathophysiology, biochemistry, and pharmacotherapy of mental disorders; emphasis placed on schizophrenia, mania, and depression; discussion of anatomical substrates and electrophysiological phenomena; clinical indications and contraindications of drug use, and strategy of pharmacotherapy. Prerequisite: introductory course in pharmacology. Su (to be offered in 1978). 2 qh. Marczynski, Radulovacki.

PL-408. Metabolism of Drugs. The metabolic fate of a variety of drugs will be presented in lectures, demonstrations, and laboratory exercises. The fate of drugs will be discussed in terms of general metabolic reactions, including hydrolytic cleavage, oxidations, specific reductions, conjugations, and lethal syntheses. The special role of microsomes in drug metabolism will be emphasized. Prerequisites: PL-325, PL-326, or equivalent. W (to be offered in 1979). 2 qh. Schulman.

PL-409. Chemical Structure and Biological Activity. Analysis of pharmacological action of drugs as related to their molecular structure and steric configuration. Prerequisites: PL-325 and PL-326. F (to be offered in 1978). 2 qh. Maynert, Foreman, Kusek.

PL-410. Molecular Basis of Cardiac Drug Action. An advanced course correlating the action of drugs on conduction, electric potentials, and contraction with cellular metabolism and energy transfer in heart muscle. Prerequisites: courses in physiology and biological chemistry. W (to be offered in 1978). 2 qh. Feinberg.

PL-420. Pharmacology of Receptors, Neurones, and Synapses. Advanced discussions of drug action on receptors and their effects on changes in ionic permeability of neurones and synapses. Topics will include transmitter synthesis, storage, release, action, and the various ways drugs can block or augment synaptic transmission in autonomic ganglia and the neuromuscular junction. Prerequisites: PL-325, PL-326, or equivalent. F (to be offered in 1977). 2 qh. Green, Anderson, Levy, Proudfit.

PL-421. Pharmacology of Central Integrative Processes. Lectures and discussions on how drugs influence specific neuronal systems within the central nervous system. These will include laboratory methodology, discussions on how cells integrate information, and how drugs selectively affect these processes. Emphasis will be placed on the neurophysiology and pharmacology of the brain stem and spinal cord. Prerequisites: PL-325, PL-326, or equivalent. Sp (to be offered in 1978). 2 qh. Anderson, Levy, Green, Proudfit.

PL-423. Pharmacology of Behavior. Lectures and discussion of drugs affecting sensory input, central integration, and behavioral output. Emphasis will be placed on EEG correlates of behavior and drug effects on sleep-wakefulness cycles, central regulation of thirst, hunger, and emotional behavior. Prerequisites: PL-325, PL-326, or equivalent. Sp (to be offered in 1978). 2 qh. Marczynski.

PL-425. Pharmacology of Catecholamines. The synthesis, degradation, storage, release, and reuptake of catecholamines will be discussed. The effects of these amines on metabolic, as well as electrophysiological, parameters will be examined. Prerequisites: PL-325, PL-326, or equivalent. Sp (to be offered in 1979). 2 qh. Maynert.

PL-426. Pharmacology of Putative Transmitters. Discussions on the synthesis, storage, and anatomical distribution of possible transmitter substances in the central nervous system. Emphasis will be placed on drugs which interfere with the metabolism or actions of the putative transmitters. Acetylcholine, serotonin, histamine, and several amino acids will be examined in detail. Prerequisites: PL-325, PL-326, or equivalent. Sp (to be offered in 1979). 2 qh. Anderson, Levy, Green, Proudfit.

PL-428. Developmental Pharmacology. Study of drugs and chemicals on the developing organism with emphasis on medical aspects. To include consideration of the reproductive processes through the early neonatal period. Prerequisites: PL-325, PL-326. F (to be offered in 1978). 2 qh. Isaac, Schulman.

PL-491. Pharmacological Seminar. F, W, Sp, Su. 1 qh. each quarter. Staff.

PL-493. Research in Pharmacology. Supervised research in area of specialization. F, W, Sp, Su. 1 to 16 qh. Staff.

PHARMACY

The Department of Pharmacy offers programs leading to M.S. and Ph.D. degrees. These are designed to give the candidate an adequate background in the basic physical, biological, and pharmaceutical sciences, and the related health disciplines. Sufficient flexibility is permitted so that the candidate can develop in breadth and in depth in selected areas of specialization. Graduate study in the department prepares qualified individuals for teaching, hospital pharmacy, industry, and research in the field of pharmacy.

The applicant should have received an undergraduate degree in pharmacy from a recognized college of pharmacy. Applicants holding degrees from a college other than a college of pharmacy may be accepted if they are currently completing the requirements for a bachelor's degree in pharmacy. Undergraduate preparation should include general and inorganic chemistry, organic chemistry, physics, biological chemistry, pharmaceutical analysis, pharmacology, and pharmaceutics. Higher mathematics including calculus and an elementary course in physical chemistry is advisable.

Candidates for the M.S. degree must include in their programs 4 quarter hours in PM-491 and at least 20 quarter hours in PM-493.

Programs of study for doctoral candidates are developed to meet the requirements of an area of specialization offered within the department. Areas of specialization include general pharmacy, physical pharmacy, biopharmaceutics, and industrial pharmacy. All doctoral candidates must take for credit 8 quarter hours of PM-491 and a minimum of 75 quarter hours of PM-493. In addition to a required core program for each specialization, elective courses may be selected from graduate course offerings in medicinal chemistry, biological chemistry, microbiology, pharmacognosy, pharmacy, and others. Upon completion of all formal course requirements, doctoral candidates must pass successfully a departmental examination which is in part written and in part oral. The thesis research must be an original investigation and should deal with some basic science project within the selected area of specialization.

The department offers a master of science degree program with emphasis in hospital pharmacy. The following courses are suggested for this program: PM-301, PM-302, PM-305, and PM-425; and MC-325. Residencies in hospital pharmacy are available at several cooperating hospitals and may be taken simultaneously with the master's program. A Certificate of Residency is awarded by the hospital upon successful completion of the residency program.

Graduate Faculty

Professors: Angel S. Arambulo, Martin I. Blake, Win L. Chiou, Bernard Ecanow, August P. Lemberger, Robert G. Mrtek, Frederick P. Siegel.

Associate Professors: Richard Hutchinson, Henri Manasse, Sarfaraz Niazi.

Assistant Professors: Rafiq Abou-Shaaban, Paul Laskar, Jesse Stewart.

PM-301. Hospital Pharmacy Practice I. This course deals with general principles and methods of administration as applied to the supervision and management of a pharmacy service in a modern hospital. Prerequisite: PM-235 or one year of experience in a hospital. W. 3 qh. Hutchinson.

PM-302. Hospital Pharmacy Practice II. Specific pharmacy programs and functions are studied in detail and how management principles are related to their successful implementation. Prerequisite: PM-301. Sp. 3 qh. Hutchinson.

PM-305. Physical Pharmacy. The problems encountered in the fabrication and preservation of dosage forms of medication are studied from the standpoint of the physico-chemical principles and laws which may lead to their solution. Chemical kinetics and catalysis are areas which are especially important. Prerequisite: PM-231. Sp. 3 qh. Ecanow, Arambulo.

PM-310. Pharmaceutical Manufacturing Unit Operations. The study of the scientific principles in the unit operations of pharmaceutical manufacturing. Prerequisite: PM-305, or consent of instructor. Su (to be offered in 1978). 3 qh. Ecanow.

PM-320. Clinical Pharmacokinetics. Application of basic pharmacokinetics and biopharmaceutics to the safe and effective therapeutic management of patients with emphasis on dosage regimen determination. Certain potent drugs such as cardiac glycosides, antiarrhythmics, antibiotics, antiepileptics, antidepressants, and salicylates will be discussed. Prerequisite: PM-237 or consent of instructor. F. 3 qh. Chiou.

PM-325. Clinical Pharmacokinetics Laboratory. Practical learning experience in clinical pharmacokinetics in various hospital patient settings and the Clinical Pharmacokinetics Laboratory of the College of Pharmacy. Prerequisite: PM-320 or consent of instructor. F, W, Sp. 3 qh. Chiou.

PM-340. Nuclear Pharmacy I. A study of the fundamentals of radiopharmaceutical science. Topics will include an introduction to radiopharmaceuticals and their manufacture, purification, quality control, dispensing, and dose calculations; laboratory design; radiation safety; and the laws and regulations affecting radiopharmacy. Prerequisites: Physics 325 or consent of instructor. W. 4 qh. Staff.

PM-350. Nuclear Pharmacy II. This course provides the theoretical and clinical basis of the usage of radiopharmaceuticals in nuclear medicine and radiology with emphasis on the usage, dosage, and routes of administration of the various radiopharmaceuticals available for specific clinical procedures. Lecture only, 3 qh. Lecture and laboratory, 4 qh. Prerequisite: PM-340. Sp. 3 or 4 qh. Staff.

PM-402. Manufacturing Pharmacy. Studies of the principles, processes, facilities, and systems used in the development, scheduling, preparation, control, and quality assurance of pharmaceutical products. Consideration of the physical, chemical, and biological interrelationships among ingredients, procedures, equipment, containers, and storage conditions. Su (to be offered in 1978). 3 to 5 qh. Arambulo.

PM-404. Pharmaceutical Kinetic Theory. Theoretical aspects and applications of the kinetics of drug decomposition, adsorption, diffusion, and solution. Miscellaneous topics include chemical epigenetic control, tracer kinetics, tissue perfusion models, rate theory of drug action. Prerequisites: MC-335, MC-336, or consent of instructor. F (to be offered in 1978). 3 qh. Niazi.

PM-405. Stability of Pharmaceutical Systems. Theories used in the evaluation and prediction of the physical and chemical stability of drugs in pharmaceutical dosage forms are discussed. In addition, fundamental factors which affect drug degradation and procedures designed to enhance stability are examined. Experimental stability determinations of selected drugs are performed, and methods for improving shelf-life stability are explored. Prerequisite: MC-336 or equivalent. F (to be offered in 1977). 3 qh. Niazi.

PM-410. Polyphasic and Disperse Systems I. A study of reversible and irreversible colloidal systems. Prerequisite: one year of physical chemistry or equivalent. Sp. 3 qh. Staff.

PM-411. Polyphasic and Disperse Systems II. Further study of colloidal electrolytes and the liquid-gas, solid-gas, and liquid-liquid systems. Prerequisite: one year of physical chemistry or equivalent. Su. 3 qh. Staff.

PM-420. Pharmacokinetics. Kinetics of absorption, distribution, and elimination of drugs will be discussed, with emphasis on compartmental modeling approach. Prediction of plasma and tissue levels of drugs and its correlation with biological activities after single and multiple dosing will be discussed. Prerequisites: PM-305 or MC-336 or equivalent. F. 3 qh. Chiou.

PM-425. Dissolution and Bioavailability of Dosage Forms. A study of various factors affecting dissolution and bioavailability of drugs. Prerequisites: PM-305 or MC-336 or equivalent. W. 2 qh. Siegel.

PM-431. Chromatography in Pharmaceutical Research. The theoretical aspects, techniques, and applications of the following types of chromatography in research in the pharmaceutical sciences are discussed: adsorption chromatography, partition chromatography, ion exchange chromatography, electrochromatography, and gel permeation (molecular exclusion) chromatography. F. 3 qh. Staff.

PM-440. Special Topics in Pharmacy. The topics to be considered may include: rheology, micromeretics, physics of tablet compression, biopharmacy, adjusted solutions, drug extraction techniques, sustained release medication, aerosols, formulation, federal regulations concerning new drug testing, etc. F, W, Sp, Su. 2 to 4 qh. Staff.

PM-491. Seminar in Pharmacy. Weekly reviews, reports, and discussions of topics drawn from the literature of pharmacy or from research. F, W, Sp. 2 qh. Staff.

PM-493. Research in Pharmacy. Individual research under the direction of a member of the staff. F, W, Sp, Su. 1 to 16 qh. Staff.

PHYSIOLOGY

Opportunities for courses and research aiming at the degree of Doctor of Philosophy are offered. Advanced courses of study are designed individually to meet the student's career objectives. The program of graduate studies includes general and mammalian physiology, biophysics, molecular physiology, and behavioral biology. The department participates in an interdisciplinary program in bioengineering (see section IV-4 and page 22).

Concurrent degree programs are also available for professional students in dentistry, medicine, and nursing who are interested in research and academic careers.

The research activities of the department include: study of the biosynthesis and mechanism of action and inactivation of hormones at the organ, cellular, and subcellular levels; elucidation of sequence and biofunctional conformation of peptide hormones, other biologically active proteins, and hypophysiotropic factors; research in physiology, morphology, biochemistry, and biophysics of reproduction; research in renal physiology, lipid metabolism, active transport, cellular physiology, neurophysiology, cellular function of skeletal muscle, respiratory mechanics, cardiovascular control, stress, and host defense mechanisms and oncology.

Doctoral candidates are expected to be prepared in undergraduate course work that includes chemistry through organic and preferably physical chemistry; mathematics through calculus; and at least one year each of biology and physics.

Graduate Faculty

Professors: Gyan C. Agarwal, Daniel Fiat, Earl E. Gose, Ruven Greenberg, Arthur F. Grimm, Philip L. Hawley, Neil A. Kurtzman, Ruy V. Lourenco, Sabath F. Marotta, Irving F. Miller, Akira Omachi, Kenneth M. Rosen, John T. Sharp, Nicholas Torok (Emeritus), Roderich W. Walter, Bert L. Zuber.

Associate Professors: Kate Bárány, Robert T. Chatterton, Robert F. Loizzi, Loren G. Martin, Charles H. Rodgers, Boris Tabakoff, Lourens J. D. Zaneveld.

Assistant Professors: Jose Arruda, Tapan Audhya, Yun Lai Chan, Geula Gibori, Paul Gudewicz, Paula L. Hoffman, Gordon L. Humphrey, Randal C. Jaffe, Mi Ja Kim, Zane F. Muhl, Clark W. Smith, Alan Springer.

Participating Staff

Professors: Ian C. P. Smith (visiting), Rajmund Somorjai (visiting).

Associate Professor: David Schlesinger.

Assistant Professor: Roxanne Deslauriers (visiting).

PY-307. Applied Physiology. Consideration in depth of a limited number of topics in physiology of primary importance to clinical personnel: cardiac failure, acid-base and electrolyte balance, edema, hormone interactions, metabolism, neurophysiology. F. 4 qh. Hawley.

PY-350. Physiology of Pregnancy. Alterations in physiological functions concomitant with human pregnancy. Intended primarily for graduate students of the College of Nursing, but open to graduate students of other colleges and qualified upper division undergraduates. Prerequisite: PY-201 or equivalent. W. 2 qh. Hawley.

PY-369. Human Physiology. Lectures and conferences in human physiology with emphasis on the nervous and endocrine systems. Prerequisites: undergraduate organic chemistry, physics, and mathematics or consent of instructor. F. 5 qh. Omachi.

PY-370. Human Physiology. Continuation of PY-369 with emphasis on muscle, circulation, and respiration. Prerequisite: PY-369 or consent of instructor. W. 5 qh. Omachi.

PY-371. Human Physiology. Continuation of PY-369 and PY-370 with emphasis on digestive tract, general metabolism, kidney, and special senses. Prerequisites: PY-369 and PY-370 or consent of instructor. Sp. 5 qh. Omachi.

PY-372. Cell Biology. A basic course covering the morphology and life processes of the cell as an organism. Ultrastructural physiology of cells, their organelles and intracelluar systems. F. 3 qh. (Same as AN-372.) Loizzi.

PY-401. Physiology of the Endocrines. Advanced study of the concepts of control of endocrine secretion; the mechanism of action of the hormones and special problems in the field of endocrinology. Prerequisite: PY-369 or consent of instructor. Sp. 4 qh. Gibori.

PY-405. Physiology of the Heart. Advanced study of basic metabolic and functional determinants of cardiac activity. Discussion of modern views and newer clinical and experimental techniques in cardiology. Prerequisites: PY-369, PY-370, PY-371. Sp. 3 qh. Staff.

PY-411. Physiology and Biochemistry of Enzymes. A comprehensive description of enzyme structure and function in physiological systems. Classification of enzyme catalytic reactions in physiology. Appropriate pathological alterations in these catalytic reactions will also be considered. Prerequisites: PY-369, PY-370, PY-371 and 8 qh. in biochemistry or their equivalents. Sp. 3 qh. Hakim.

PY-416. Biochemistry and Physiology of Muscle Contraction. (Same as BC-416, q.v.) W. 3 qh. Bárány.

PY-420. Neural Correlates of Behavior. A lecture course designed to give the student an understanding of behavioral mechanisms from an integrated view of neuroanatomy, neurophysiology, and endocrinology. W (to be offered in 1980). 3 qh. Rodgers.

PY-422. Vestibular Physiology. The vestibular apparatus, as the most ancient sensory organ, is best suited for studying the principles of sensory organ physiology. Its evolution from the still existing primitive level to its complex and extensive appearance in man is followed. The mechanisms of the receptor system, the neural centers, and the vast reflex arc are discussed. Prerequisites: PY-369, PY-370, PY-371. W. 3 qh. Torok.

PY-431. Molecular Biophysics. Structural and dynamical studies of biomolecules by means of biophysical techniques, fast relaxation techniques, dielectric studies, microwave spectroscopy, magnetic resonance (nmr and esr), mossbauer spectroscopy, and X-ray scattering and diffraction. Theory and application. Sp (to be offered in 1979). 3 qh. Fiat.

PY-432. Nuclear Magnetic Resonance (NMR) in Biophysics. An introduction to the principles of analysis of structure and dynamics of biomolecules by means of nuclear magnetic resonance spectroscopy with emphasis on peptide hormones, proteins, nucleic acids and polynucleotides, enzymes, and membranes. Prerequisites: college chemistry, physics, and mathematics; one year of each. W. 3 qh. Fiat.

PY-433. Nuclear Magnetic Resonance (NMR) in Biophysics. Continuation of PY-432. Prerequisite: PY-432. Sp. 3 qh. Fiat.

PY-440. Special Topics in Physiology (e.g., bioengineering, endocrinology, neurophysiology, etc.) F. 3 qh. Staff.

PY-441. Special Topics in Physiology: Stress Physiology. F (to be offered in 1978). 3 qh. Marotta.

PY-442. Special Topics in Physiology: Pulmonary Physiology. F. 3 qh. Sharp.

PY-444. Special Topics in Physiology: Renal Physiology. Renal physiology, renal endocrinology, acid-base balance, fluid and electrolyte metabolism. Prerequisites: PY-369, PY-370, PY-371, or Medical Core Curriculum, Year 1. Sp. 2 qh. Kurtzman.

PY-469. Methods in Experimental Physiology. A laboratory course designed to acquaint students with advanced techniques and methodology in physiologic investigations. Primarily for students in physiology. Registration limited to 20. F. 3 qh. Staff.

PY-470. Methods in Experimental Physiology. Continuation of PY-469. W. 3 qh. Staff.

PY-471. Methods in Experimental Physiology. Continuation of PY-469, PY-470. Sp. 3 qh. Staff.

PY-486. Cell Physiology. The structural and functional organization of the cell. This will include a discussion of the function of the nucleus and the cytoplasmic particulates and their interaction. Prerequisites: PY-369, PY-370, PY-371, and BC-361 and BC-362. F (to be offered in 1980). 5 qh. Loizzi.

PY-488. Transport Across Cell Interphases. Discussion of basic mechanisms underlying transport of water, electrolytes, and non-electrolytes across biological membranes. Prerequisites: PY-369, PY-370, PY-371, BC-361, and BC-362. W (to be offered in 1979). 3 qh. Omachi, Chan.

PY-491. Seminar in Physiology. Formal research presentation by staff and distinguished guests. Prerequisites: PY-369, PY-370, PY-371. F, W, Sp, Su. 2 qh. Gibori.

PY-493. Research in Physiology. Individual research under the direction of a member of the staff. F, W, Sp, Su. 1 to 16 qh. Staff.

PY-494. Tactics and Strategy of Research in Physiology. In this course there will be an analysis of the various approaches which have been of recent importance in solving problems in physiology. New techniques, preparations, or new designs which have been instrumental in producing advances in physiology will be discussed and analyzed in depth. Sp, Su. 2 qh. Staff.

PUBLIC HEALTH SCIENCES

The Department of Public Health Sciences offers programs leading to the M.S. and Ph.D. degrees.

These educational programs are designed to prepare persons for careers in research, teaching, disease prevention, health promotion, and environmental protection. Career opportunities are available in academic and other institutions with graduate and research programs related to public health or preventive medicine and governmental, private, and voluntary organizations involved in the prevention and control of disease.

Course work and independent research opportunities leading to a Master of Science degree are offered in the following:

- The fundamental concepts and techniques of epidemiology and biometry along with their practical applications.
- The basic philosophies, technologies, and practices of health care and program administration.
- The identification and assessment of the economic and political factors related to the organization and delivery of health services.
- The interaction of health and disease with environmental and social factors and the resultant effect on the well-being of the individual and the community.
- The dependence of health programs on individual and group understanding of hygenic principles and the significance of the social structure and of the medium of education and information exchange in achieving this end.
- Specialized study areas essential to the successful conduct of personal health care, environmental health activities, and community health functions.

The Master of Science program in the Department of Public Health Sciences requires 72 quarter hours, divided as follows:

Biometrics in Public Health I	3 quarter hours
Principles of Epidemiology	3 quarter hours
Program Area(s)	13 to 23 quarter hours
Electives and seminars	21 to 31 quarter hours
Research	22 quarter hours
Total	72 quarter hours

A Master of Science degree may be earned in addition to a Master of Public Health degree from the School of Public Health (see section V-8). Of the 35 additional quarter hours required, 22 should be in thesis research and 13 in additional course work, of which 6 quarter hours must be at the 400 level. Up to 6 quarter hours of HI-393 and a maximum of 6 quarter hours of HI-440 may be applied to the Master of Science degree.

Additional Admission Requirements for the Ph.D. Program

- Individuals with an M.P.H. or other non-M.S. postbaccalaureate academic education may also compete for entry into the Ph.D. program.
- The generally applied minimal standard of admission includes presentation of an undergraduate GPA of 4.0 or higher (where A = 5.0); a Graduate Record Examination (GRE) is required of all applicants in which the scores (verbal and quantitative) must total at least 1,000.

In addition to assessing the applicant's potential for success in the graduate program, the Admissions Committee also considers the applicant's potential for making a contribution to the advancement of public health science upon completion of the program. Among those candidates who are judged to be qualified academically, consideration is given to demonstrated leadership, to concern for the public welfare, and to research potential. Prior experience as reported in the application, three required letters of recommendation, and personal interviews, when judged appropriate, are used to assess these qualities.

The Ph.D. program of the Department of Public Health Sciences is sufficiently flexible to accommodate the aspirations of a diversity of students with various backgrounds and various levels of educational attainment. A single prime requirement, beyond the bachelor's degree, is a demonstrated ability to plan and successfully complete significant health-related research (any one or a combination of laboratory, field, computer, or other approaches).

Graduate Faculty

Professors: Lyndon R. Babcock, Bernard H. Baum, Bertram W. Carnow, Viron Diefenbach, Alan W. Donaldson, Samuel Epstein, Henry M. Gelfand, William N. Haenszel, Edward R. Hermann, S. G. Huneryager, Wadie W. Kamel, Leo Levy, Paul S. Levy, Edward A. Lichter, Dale E. Mattson, Virginia M. Ohlson, Paul Q. Peterson, George A. Saxton, Jr., Arthur H. Wolff, Jean M. Wood.

Associate Professors: Cornelius J. Askew, Badi M. Boulos, Edwin H. Chen, Robert Cohen, Theodore C. Doege, Clyde C. Doughty, W. Carey Hanly, Swailem S. Hennein, Muhammad Iqbal, Zafar Mohd Iqbal, Margaret M. Kirchman, Joseph Levin, Alvin L. Miller, Robert L. Northrop, Saul H. Rosenberg, Louis Rowitz, Mary Jane Schlinger, Richard A. Wadden, Wallace H. Wilson.

Assistant Professors: Jonathan Amsel, Gary R. Brenniman, Tom Christoffel, Kevin G. Croke, Gerald A. Gardner, Ross Mullner, Tsukasa Namekata, Miriam B. Rodin.

Instructor: Marilyn Farber.

Participating Staff

Professors: Bruce L. Douglas, Hiram Sibley, Edwin H. Thomas.

Associate Professors: Binyamin Z. Lebovits, Colette M. Rasmussen, Carl Zenz.

Assistant Professors: Jeanne B. Blumhagen, JoAnn Cannon, Vijay Chandra, Alice Dan, John D. Denne, S. Hessl, Theodore L. Koontz, Barry Levine, Nail Ozerol.

Instructors: Janet A. Holden, Michael S. West.

Research Associates: James Melius, Alice K. Rader.

HA-300. Principles of Epidemiology. An introduction to the analysis of the distribution of infectious and non-infectious diseases, the study of the determinants of health and disease in populations, and the application of the epidemiologic method to disease prevention and control. Prerequisites: HB-300 or concurrent registration in HB-300, or equivalent. F, W, Su. 3 qh. Gelfand and Staff.

HA-310. Epidemiology of Infectious Diseases. Lecture-discussions concerning the epidemiological aspects of selected infectious diseases. The occurrence and control of diseases of current importance will be emphasized by staff and guest speakers. Student participation is based on selected readings. Prerequisites: HA-300, or consent of instructor. W. 3 qh. Rasmussen and Northrop.

HA-313. Human Genetics in Public Health. Fundamentals of human genetics, combining language, concepts, and methods of genetics with a study of the effects of newer genetic knowledge on the community. Basic genetic information will stress action of gene in transmission and development of normal and abnormal traits. The prospect for genetic change in man through screening programs, genetic counseling, genetic engineering, and other attempts at genetic manipulation in the individual or in the community will be evaluated in the light of present knowledge of population genetics and health care priorities. Prerequisites: none, but undergraduate biology recommended. Su. 3 qh. Amsel.

HA-401. Epidemiologic Methods. Introduction to use of various epidemiologic tools and approaches in the analysis and control of human diseases. Topics include: collection, analysis, and interpretation of epidemiologic data; surveys and survey design; clinical trials, experimental models; case control or other research studies. Understanding of the epidemiologist's role is enhanced by presentations of epidemiologists practicing among different constituencies. Prerequisites: HA-300 or equivalent with consent of instructor. Sp. 4 qh. Mullner, Melius, and Farber.

HA-410. Advanced Infectious Disease Epidemiology. Epidemiologic analyses of infectious agents associated with natural disease groupings in man, presented as student-led discussions based on assigned readings from the literature. Emphasis placed on critical examination of data upon which the natural history of infectious diseases is established. Prerequisites: HA-300 and biological, medical, or microbiological background, or consent of instructor. Sp. 3 qh. Northrop.

HA-411. Epidemiologic Problems: Noninfectious Diseases. Lecture-discussions of selected topics in noninfectious diseases. Faculty and guest lecturers will lead discussions. Students will present critical analyses of selected current reference materials. Emphasis placed upon problems in descriptive and analytic epidemiology, assessment of causal relationships, and evaluation of preventive efforts. Prerequisites: HA-300, or consent of instructor. W. 3 qh. Chandra and Farber.

HA-412. Epidemiologic Problems: Social and Behavioral Disorders. Lecture-discussions of selected behavioral disorders. Emphasis will be placed on the descriptive epidemiology of the topic under consideration, the difficulties encountered in descriptive and etiological studies, and research presently underway or projected. Prerequisites: HA-300, or consent of instructor. W. 3 qh. Rodin, Levin, and Rowitz.

HA-414. Epidemiology of Injury. Introduces epidemiologic principles and approaches applied to injuries, especially those related to vehicular crashes, home environment, and occupation. Considers history, scope, time, place, person, medical conditions, drugs, control programs, and research efforts and needs. Lectures and discussions are supplemented by oral and written reports of students. Prerequisites: HA-300, or consent of instructor. F (to be offered in 1979). 3 qh. Doege.

HA-415. Survey of Cancer Epidemiology I. Epidemiology of selected cancer sites illustrates various etiologic factors like diet, hormones, viruses, radiation, tobacco, and chemicals. Original data are critically examined. Correlation of epidemiology with pathology of suspect precursors and animal investigations is stressed. Students will synthesize information from interdisciplinary investigations and use the information to plan and assess the potential of proposed new lines or research. Prerequisites: HA-401 or permission of instructor. Sp. 3 qh. Haenszel and Amsel.

HA-416. Survey of Cancer Epidemiology II. Continues HA-415 and emphasizes comprehensive examination of the epidemiology of cancer sites. Prerequisites: HA-415 or consent of instructor. F. 3 qh. Haenszel.

HA-491. Critical Reading of Current Epidemiologic Literature. Reading of recently published scientific papers of epidemiologic interest, to promote breadth of knowledge and critical examination of evidence. Each student will study and review at least two papers and present them to the class for general discussion. Prerequisites: HA-300 and HB-301, or consent of instructor. Sp. 2 qh. Gelfand and Staff.

HB-300. Biometrics in Public Health I. The course is designed to give a familiarity with the nature, scope, and terminology of biostatistics, an understanding of appropriate uses and common misuses of health statistics, and a working knowledge of and practice in the application of selected statistical procedures. Theoretical aspects are held to a minimum; applicability of course content is stressed relative to current health problems and programs. Prerequisite: consent of instructor. F, W, Su. 3 qh. Mattson and Staff.

HB-301. Biometrics in Public Health II. Continues introduction to statistical procedures and techniques applicable to the health field. Skills are developed in handling and presenting mass data, evaluating scientific literature, and effectively utilizing and working with professional statisticians. Prerequisites: HB-300, or consent of instructor. F, W, Sp. 3 qh. Mattson and Staff.

HB-310. Computers in the Health Sciences. Special emphasis is given to the utilization of computers in the handling of health data and the administration of health programs. Topics include principles of computing, methods of data processing, computerized registry, computer aided instruction, health care management, and computer simulation. Prerequisite: consent of instructor. W, Sp. 2 qh. Chen.

HB-320. Research Methods in Public Health. Course presents the general principles of research design. Topics covered include the design of preliminary and exploratory studies, prospective and retrospective surveys, clinical trials, and experiments. Principles learned are applied to evaluation of literature selected from the health sciences and to the class projects in design of public health studies. Prerequisites: HB-300 or equivalent and consent of instructor. 3 qh. Mattson.

HB-350. Sampling and Survey Methods. This is an application oriented course in sampling theory and survey methodology. It discusses the basic sample designs and estimation procedures used in sample surveys, as well as the logistics and economics of carrying out the surveys. Special attention is given to the problems involved in obtaining information on health characteristics from sample surveys which involve personal interview physical examinations and the eliciting of data from health records. Prerequisites: HB-300 and HB-301, or consent of instructor. W. 3 qh. P. Levy.

HB-462. Experimental Design. The following topics will be presented with particular reference to their relevance in the health sciences: completely randomized designs, randomized block designs, incomplete block designs, multiple comparison techniques, repeated measures designs, factorial experiments, analysis of covariance, clinical trials. Prerequisites: HB-300 and HB-301, or consent of instructor. Sp. 3 qh. Rosenberg.

HB-470. Statistical Methods for Qualitative Data. Statistical analysis of qualitative data including classical chi-squared tests and more recent methods based on logistic models are developed through lectures, reading, and exercises. Original substantive articles from the health sciences literature which utilize these methods are discussed. Prerequisites: HB-301, or consent of instructor. Sp. 3 qh. P. Levy.

HC-300. Contemporary Health Care Services. The medical care system: health professions, ambulatory care, hospitals, health planning, group practice and HMOs, private health insurance, Medicare, Medicaid, national health insurance, malpractice, utilization review and PSRO, long-term care, cost control, and political trends. Prerequisites: Registration in School of Public Health or Graduate College, senior medical or dental students, or permission of instructor. F, Sp. 3 qh. Wilson.

HC-311. Health Care Services: The Community Microsystem. Physician practice, hospital and long-term care organization and functioning, inner city health services, and other topics. Stress placed on detailed description and analysis of each topic. Prerequisites: HC-300, or consent of instructor. W. 3 qh. Wilson.

HC-313. Medical Care Organization: Epidemiologic Analysis. Consideration of problem areas in contemporary health services research, focusing on substantive issues facing health delivery systems in the United States. Course will encompass selected questions of the health service system in terms of quality, access, and utilization, and the social and epidemiologic analysis appropriate to these issues. Prerequisites: HA-300, HB-300, and HC-300, or consent of instructor. W. 3 qh. Askew.

HC-366. Sociology of Mental Disorders. The primary objective is to investigate the sociocultural variables involved in mental illness. The course will involve the study of social epidemiology of mental illness, patient career cycle, societal labeling and stigma, new mental health treatment models, and community aspects of mental health planning. Prerequisites: basic course in sociology or HC-300, or consent of instructor. W, Su. 3 qh. Rowitz.

HC-367. Sociology of Mental Retardation. This course will be concerned with the investigation of the social factors involved in mental retardation. Discussion will involve the investigation of the social epidemiology of retardation, family adjustment problems, patient career cycle, and community relationships. Prerequisites: basic course in sociology or HC-300 or consent of instructor. Sp. 3 qh. Rowitz.

HC-370. Mental Hygiene and Public Health. Presentation of the relation of mental health programs to health planning with stress on (1) understanding the scope and limitations of mental health programs, (2) programs of control and prevention of mental disorders, and (3) essential points in evaluation of mental health programs by health managers. Prerequisites: HC-300 or consent of instructor. F, W. 2 qh. Staff.

HC-391. Seminar in Urban Medicine. In seminar-discussion format, students, staff, and selected visitors will participate in literature analysis and special topic reviews. Critical reading and evaluation of topics will be stressed. Prerequisites: HC-300 or consent of instructor. W, Sp. 2 qh. Lichter and Staff.

HC-414. Utilization Review and Medical Audit. Seminar discussion on planning, implementation, and evaluation of a utilization review and medical audit hospital program. Practical orientation with student participation in actual review and audit. Prerequisite: HC-300 or HC-313 or consent of instructor. 2 qh. Cohen.

HC-441. Maternal and Child Health I. Survey course designed primarily for students without health professional backgrounds and for health professionals without experience in public health. Presents the field of maternal and child health in a health care systems format of program planning, implementation, and evaluation. Deals with an overview understanding of major components of an organized program for maternal and child health services. Prerequisites: HC-300 or consent of instructor. W. 3 qh. Potsic.

HC-442. Maternal and Child Health II. Seminar series for health professionals, students with field experience in health programs, or students who have completed HC-441. Using a systems program format, an in-depth analysis of major maternal and child health programs will be developed with active leaders from on-going projects. Students will develop an interdisciplinary approach to problem solving for complex health problems of women and children. Emphasis placed on program planning, implementation, and evaluation. Prerequisites: HC-300 and HC-441, or consent of instructor. Sp. 3 qh. Potsic.

HC-451. Chronic Disease — Aging I. Outlines the incidence of chronic diseases of varying etiologies affecting all age groups as to their socioeconomic impact, health care needs, and research implications. Emphasizes pathophysiology and socioeconomics of aging. Prerequisites: HA-300, HB-300, and HC-300, or consent of instructor. W. 3 qh. Gelperin.

HC-452. Chronic Disease — Aging II. Details of major chronic disease prevention, management, and research programs in retrospect and prospect; analyzes specific needs of and services for the elderly. Prerequisites: HC-451 or consent of instructor. Sp. 3 qh. Gelperin.

HC-468. Contemporary Trends in Community Mental Health. Course provides overview of contemporary practices in the field of community mental health from the conceptual perspective of public health theory. Emphasizes theories of crisis intervention, effective management of both acute and chronic mental disorders, ethical and legal issues in mental health care, and approaches to the prevention of mental illness. Prerequisites: HC-300 or consent of instructor. F. 2 qh. L. Levy.

HC-469. Mental Health in Urban Areas. Examines ecological structure of the city with special reference to problems posed to successful human adaptation. Deals specifically with such problems as drug abuse, aging, crowding, distribution of mental disorders in urban areas, mobility of persons, and programs which propose to deal with urban problems. Prerequisites: HC-300, or consent of instructor. W. 2 qh. L. Levy.

HC-472. Alcohol and Drug Abuse in the Community. Seminar in alcoholism and drug abuse examining broader concepts of current problems including planning, administration, research, treatment, finance, and public policy in drug abuse and alcoholism programs. Different models and approaches to prevention and treatment are stressed. Prerequisite: consent of instructor. 3 qh. Levin.

HC-473. Health Care Services in Addictions. Seminar focuses on public health implications of primary health care delivery aspects of therapeutic problems and procedures for alcoholics and drug abusers. Different theoretical and clinical models and procedures are used to develop public health approaches to detoxification, rehabilitation, and prevention. Prerequisite: consent of instructor. 3 qh. Levin.

HC-491. Seminar in Health Care Services. Seminar in health services research. Graduate students will review and analyze current problems of research design and limits of methodologies in health services research. Articles that use survey methods, epidemiologic methods, and operations research methods will be included. Prerequisites: HC-313 or registration in any Master of Science or doctoral program, or consent of instructor. F, W, Sp. 2 qh. Lichter.

HE-300. Principles of Environmental Quality. Study of environmental problems with emphasis on health aspects, interactions among man, resources, and environment within the terrestrial systems, trends, and projections. Environmental insults within the air, water, and land environments. Legal and socioeconomic considerations. Environmental impact analyses. Prerequisite: consent of instructor. F, W, Sp. 3 qh. Brenniman and Holden.

HE-301. Community Hygiene and Consumer Protection. Principles of transmission and prevention of foodborne, waterborne, and vectorborne diseases. Health and economic factors associated with substandard housing, pesticides, air pollutants, heavy metals, radiation, food additives, noise, and hospitals. Overview of regulatory programs. Emphasizes fundamentals of microbiology and chemistry as related to health problems. Prerequisites: enrollment in School of Public Health or consent of instructor. W, Su. 3 qh. Hallenbeck.

HE-311. Water Quality Management I. Water resources and uses; the sources, types, and pathways of water pollutants; and the economic, nuisance, and health effects of water pollution are studied. Regulatory standards and control programs for water and wastewater are covered in the framework of public health, socioeconomic, and political considerations. Elements of public and private waste and water treatment systems are reviewed. Prerequisites: HE-300 or EnrE-261 or equivalent or consent of instructor. Sp. 4 qh. Brenniman and Wadden.

HE-331. Air Quality Management I. Sources, control, dispersion, and effects upon receptors of air pollution; health and other adverse effects, meteorology and dispersion estimation, photochemistry, aerosol characterization. Prerequisites: HE-300 or EnrE-261 or equivalent, or consent of instructor. W. 4 qh. Wadden.

HE-412. Water Quality Management II. Water quality is characterized in terms of mathematical, physical, chemical, and biological parameters; modeling of receiving waters for pollutant distributions; steady and transient temporal state analysis; evaluation of trends in regulatory and technological control; development of methods for determining environmental impact of water pollution sources. Prerequisites: HE-311 or EnrE-372 and Math-220 (Differential Equations) or equivalent, or consent of instructor. F (not to be offered in 1978). 3 qh. Wadden and Brenniman.

HE-414. Radiological Health. Properties and production of ionizing and nonionizing radiations with emphases on principal sources of population and occupational exposures including medical, nuclear, industry, and microwave sources. Units of exposure, dose, and radioactivity and methods of detection and measurement. Special attention to the principles of radiation protection and the biological effects of principal public health concern. Prerequisites: HE-300 or HE-301, graduate or professional standing, or consent of instructor. Sp. 4 qh. Wolff and Miller.

HE-432. Air Quality Management II. Air quality management: integration of diverse aspects. Data interpretation, health effects and setting of standards, cost-benefit analyses, mathematical modeling, administration and policy implementation; case studies of policy alternatives. Prerequisite: HE-331. F. 3 qh. Wadden.

HE-465. Management of Land and Urban Resources. Man's use and misuse of the land environment with emphasis on densely populated metropolitan areas. Health, physical, and social environmental aspects of land use. Economics, geography, quality-of-life considerations; derivation and application of land use models and simulations. Prerequisites: HE-300 or Geog-326 (Chicago Circle campus). W. 4 qh. Babcock.

HE-475. Environmental Policy Implementation. Application of environmental, health management, and other course work to actual and simulated situations. Opportunity to work closely with agency personnel and others on timely controversial environmental questions. Flexible format; course emphasis changes from year to year. Prerequisites: two environmental courses and consent of instructor. Su. 2 qh. Babcock and Staff.

HI-321. Environmental and Occupational Laboratory. Basic instrumentation and procedures related to measurement and surveillance of toxic substances and stressors in the environment and workplace. Included are measurement techniques for air, water, noise, radiation, and sanitary bacteriology. Lectures, demonstrations, and student-performed experiments are utilized. Prerequisites: HE-300, HO-300 or equivalent, or consent of instructor. W. 3 qh. Brenniman, Miller, Wadden, Holden, and Hallenbeck.

HI-393. Independent Study. Selected aspects of specific public health problems. Independent study under close supervision of faculty member. Not more than six quarter hours of independent study may be elected. Prerequisites: consent of the instructor responsible for supervision, and at least one course in the program area in which the independent study is to be done. F, W, Sp, Su. 1 to 5 qh. Staff.

HI-394. Environmental-Occupational Health Seminar. Discussions of current environmental health and occupational health topics, with presentations by students, faculty, and visiting scientists. F, W, Sp, Su. 1 to 2 qh. (Credit for all registrants is the same for a given quarter and will be specified prior to registration.) Staff.

HI-421. Advanced Laboratory Topics in Environmental and Occupational Health. Application and integration of sampling and measurement techniques from atmospheric, physical, and biological sciences in order to characterize accurately interior and ambient environments; individual or group study under direction of an Environmental Health Sciences or Occupational and Environmental Medicine faculty member. Prerequisites: HI-321 and HE-311 or HE-331, or equivalent. Sp, Su. 1 to 4 qh. Wadden, Miller, EHS and OEM Staff.

HI-440. Special Topics in Public Health Sciences. Specific topics in biometry, environmental health, epidemiology, health management, occupational medicine, health care, international health, and other aspects of public health are presented by staff and visiting faculty. Course content will vary. Prerequisite: consent of instructor of specific course. F, W, Sp, Su. 1 to 5 qh. Staff.

HI-493. Research in Public Health Sciences. Individual research in public health under the direction of a faculty member. Usually directed toward the thesis requirements of the Master of Science, Doctor of Philosophy, and Doctor of Public Health degree programs. Prerequisites: required courses specified in given degree programs and/or permission of thesis adviser. F, W, Sp, Su. 1 to 16 qh. Staff.

HM-300. Basic Principles of Management in Public Health. An introduction to the principles of planning, organizing, staffing, directing, and controlling applied to health programs. The course is designed to integrate theory and practice using the case-study method in project planning, decision making, delegation of authority, job description and standards of performance, budget development, scheduling, systems approach to tasks, implementation, and evaluation. Other topics include health industry administration, federal grants and contracts, forecasting, and change. Prerequisite: consent of instructor. F, W. 3 qh. Gardner.

HM-310. Principles of Areawide Health Planning. An introduction to the health planning movement in the United States with emphasis on Chicago and Illinois. Principles and policies related to the planning process including the authority, structure, and function of areawide agencies are examined. Students are exposed to officials of local areawide health planning agencies. Prerequisites: HM-300 or consent of instructor. W. 3 qh. Denne and Staff.

HM-311. Practices in Areawide Health Planning. Using a task force approach, students will examine and/or perform the following practices: involve consumers and providers in determining priorities based on human needs; determine and quantify health problems; identify health goals and program objectives; describe institutional objectives, resources, and manpower requirements; identify gaps in health care access, services, and financing; examine program and facility development or change; search for community, political, and financial support; evaluate effectiveness of new programs and facilities; study the role of governing board and staff of an areawide health planning agency; recognize the importance of communications and public media relationships; understand the use of political action. Prerequisites: HM-310 or consent of instructor. Su. 3 qh. Sibley.

HM-312. Data Collection and Analysis for Areawide Health Planning. A course designed to analyze current questions in areawide health planning through data collection, processing, analysis, and presentation. Focus on data sources including established demographic, socioeconomic, health, and utilization information, as well as acquisition of original information through survey techniques. Organization of data for processing and meaningful retrieval. Use of analytical techniques applicable to effective data use. Selection of data for evaluation in the planning process through narrative, charts, tables, and maps. Prerequisites: HM-310 or HM-311, or consent of instructor. Sp. 3 qh. Thomas.

HM-313. Information Utilization and Interpretation in Urban Health Planning. Overview of historical and current procedures and policies regarding data collection and interpretation for health planning, with emphasis on urban planning. Both secondary and primary data collection methodologies, including varied statistical reporting and presentation techniques. Prerequisites: HM-300, HA-300, and either HM-310, HM-311, or HM-312, or consent of instructor. Su. 4 qh. Denne.

HM-320. Health and the Political Process. Lecture-discussion course designed to assist students to develop an understanding of the impact of the political process and politics on public health programs. Includes practical assignments and guests who are directly professionally involved in programs or events which illustrate subjects discussed in the course. W. 2 qh. Douglas.

HM-325. Introduction to Managerial Health Economics. Introduction to basic terminology and tools of managerial economics applied to health problems or resource allocation in the production of health services. Topics include: introduction to systems analysis approaches; analysis of health program costs; basic financial planning methods; cost-effectiveness and cost-benefit analysis. A case-study approach is employed to relate techniques to realistic health management problems. Prerequisites: none. W, Su. 3 qh. Croke.

HM-326. Budgeting Systems Applied to Health Programs. A discussion course regarding selected topics with respect to the financing, welfare, and economic impacts of public health programs. Topics include: preparation of master budgets; development of budgetary standards; program planning and budgeting methods; program review and evaluation techniques. Case-study approach is employed to relate techniques to realistic health management problems. Prerequisite: HM-300. Sp. 2 qh. Croke.

HM-330. Communications and Community Health Education. Planning and education are presented as processes which consider both the perceived needs of the planner and the consumer in the community. Through a series of small group discussions, visits to communities, reading, didactic and open-ended instruction, students gain new insights into the needs of communities; personal and community communications and motivations; listening/observation skills; and cognizance of verbal and nonverbal communication. Prerequisite: consent of instructor. Sp. 3 qh. Cannon and Staff.

HM-340. Legal Foundations of Public Health and Medical Care. Provides a basic foundation concerning legal and constitutional authority in public health and medical care fields in the United States. Covers scope of governmental authority and sources of regulation. Includes topics on hospital law, health personnel licensing, laws and decisions on abortion, sterilization, fetal research, health inspection, search and seizure, and legal rights of special patient groups. Prerequisite: consent of instructor. W. 3 qh. Christoffel and Guest Lecturers.

HM-341. Current Legal Problems Relating to Personal Health Services. Federal and state case law, statutes, and regulations affecting the provision of health services; authority and limitations which affect health facilities and providers; effects of reimbursement policies on provider institutions, administrators, governmental agencies, and health professionals; and the obligations owed to and the rights of patients. Prerequisite: HM-340 or consent of instructor. Sp. 3 qh. Christoffel.

HM-346. Ethics for Health Professionals. Defines the major systems of philosophical ethics and relates these to the health professions; also sketches characteristic Catholic, Jewish, and Protestant perspectives in ethics, and reviews codes of ethics of major health professions. Theory and process of ethical thinking applied to critical bioethical issues in patient care. Prerequisite: consent of instructor. W. 2 qh. Overholt and Guest Lecturers.

HM-451. Organization Theory Applied to Health Programs. A study of classical and modern theories of organization and their application to health programs. Organization structure, processes of organization, line and staff relationships, management controls, managerial decision making and organizational objectives and restraints, management function, formal and informal organization, bureaucracy, behavioral science concepts are covered in the context of health agencies and program development. Prerequisites: HM-300 or consent of instructor. F. 3 qh. Baum.

HM-452. Administrative Practices in Health Settings. Analysis of human problems in management and organization in health settings. Dynamics of leadership in the working organization, group dynamics, administrative formulation, and other relevant behavioral science concepts. Approach uses case studies of health personnel and industry. Prerequisites: HM-300, HM-451, or equivalent, or consent of instructor. W. 3 qh. Huneryager.

HM-453. Health Personnel Management. Health personnel management, programs, and policies. Recruitment of health professionals and auxiliaries, manpower requirements, staffing, training, and development. Qualifications standards, performance review, motivation, and morale. Developing leadership in supervisory health managers, wage and salary administration and management, labor relations. Prerequisites: HM-300 or equivalent or consent of instructor. Sp. 3 qh. Baum.

HM-454. Advanced Techniques of Management in Public Health. Seminar discussions and student work projects dealing with grant and proposal writing, the application and review process, and practical notes on obtaining and spending funds. Cases are used to analyze and evaluate grant and legislative proposals, to study problems of reorganization, and to implement executive orders for change in management practices. Prerequisites: HM-300, HC-300, or consent of instructor. Sp. 3 qh. Diefenbach.

HM-465. Communicating and Marketing Health Programs. How health professionals can utilize marketing concepts to aid in the development and communication of health programs. Cases are utilized to demonstrate the practical application of marketing, communication, and persuasive strategies both within the health organization and in approaching the outside public, especially the consuming public. Prerequisites: HM-300 or Marketing-463 (Chicago Circle campus) or consent of instructor. W. 4 qh. Schlinger.

HO-300. Principles of Occupational Health and Environmental Medicine. The impact of the environment on human health and human disease is presented as a host-environment interaction that is defined by adaptive capacity to environmental pollutants. The workplace is emphasized, but concepts of threshold, body burden, synergism, antagonism, and levels of intervention will be discussed as a disease continuum within the total human environment. Occupational hazards will be epidemiologically assessed; methods of prevention and control as stipulated in the Occupational Safety and Health Act of 1970 will be described; and psychosocial aspects related to rehabilitation of the impaired will be considered. Prerequisites: advanced undergraduate, graduate, or professional standing, or consent of instructor. F, W. 3 qh. Carnow and Staff.

HO-302. Physiological Adaptation in the Workplace. The workplace presents a variety of physical-chemical stressors that elicit human adaptive responses to permit not only survival but also the ability to perform efficiently without undue psychophysiological compromise. Physiologic definitions of human exposure to noxious gases and particles, noise, heat with varying degrees of humidity, and hyperbarics — all determine the extent of protective measures that must be implemented for the workplace to prevent accidents and the onset of occupational diseases. Prerequisites: HO-300 or consent of instructor. Sp. 3 qh. Carnow and Staff.

HO-303. Industrial Hygiene I. History and future of industrial hygiene; industrial hygiene survey, records, reports; evaluation of effectiveness of industrial hygiene program; methods of measuring and evaluating effects on man of noise, electromagnetic radiation, light, heat, humidity; ventilation; respiratory protection; laboratories, field trips. Prerequisite: HO-300 or consent of instructor. 3 qh. Hermann, Miller, Peterson.

HO-321. Biological Basis of Environmental and Occupational Health Standards. Study of the biological basis of environmental and occupational health standards. In addition to lecture-discussion sessions, the students will work with the Environmental Health Resource Center in the development of current health criteria documents. Prerequisite: consent of instructor. F. 3 qh. Carnow and Staff.

HO-327. Critical Episodes in Environmental Health. Human health effects of specific toxic substances are discussed through examination of selected critical incidents which received considerable public attention. Emphasis is placed on the etiology of the incident, on measures which were taken to stop the incident, and on prevention of future incidents. Prerequisites: HE-300 or consent of instructor. W. 2 qh. Namekata.

HO-351. Occupational Psychology. The psychosocial impacts of work experience. An analysis of the psychosocial stresses (social, personal, emotional) created by the workplace, their economic costs and impacts upon the life of the worker. Special emphasis is placed upon conflicts, drug addictions, boredom, accident patterns, turnover, physical illness, and mental health, including such effects as marital disharmony and suicide. Prerequisites: HO-300 or consent of instructor. Sp. 3 qh. Lebovits.

HO-415. Environmental Toxicology I. This course will offer a series of introductory lectures in the fundamental principles of toxicology, including toxicity *per se,* carcinogenesis, mutagenesis, and teratogenesis. The course will also deal with major classes of toxic chemicals, principles of pathology, problems of environmental and occupational carcinogenesis, mythologies in toxicology, and benefit-risk considerations. Prerequisites: HO-300 or consent of instructor. W. 3 qh. Epstein, Levine.

HO-416. Environmental Toxicology II. This is an advanced course in toxicology and will be based on a series of topics selected because of their illustrative toxicological interest, in areas including chronic toxicity, reproductive toxicity and teratology, and carcinogenesis. The topic areas will be also selected to reflect their impact on evnironmental and occupational health, such as food additives, household products, pesticides, nitrosamines, vinyl chloride. Active participation of students will be required. Prerequisites: HO-415 or consent of instructor. Sp. 3 qh. Epstein, Levine.

HO-444. Occupational Safety. Health viewpoint applied to safety with emphasis on engineering; history; records; injury rates, epidemiologic methods. Workmen's compensation; human behavior and safety; safety organization; methods of accident control designing for safety; materials handling and storage; identification of hazardous occupations and general techniques of identifying hazards. Prerequisites: HO-300 or consent of instructor. Su. 2 qh. Miller and Hermann.

HO-451. Occupational and Environmental Diseases I. Considers clinical disease caused by physical and chemical agents in the workplace. Sources and uses of materials, their toxicological properties, number of workers exposed, epidemiologic studies of cause, modes of entry, pathophysiology, diagnosis, treatment, and prevention will be discussed. Methods for defining populations at high risk to various toxic substances, the role of genetic deficiencies, chronic disease, smoking, diet, and synergism with other materials will be explored. The use of diagnostic tests to detect preclinical and subclinical disease will be examined. Materials to be considered include trace metals, solvents, acids, alkalis, plastics, and pesticides. Prerequisites: nurse, physician, consent of instructor. W, Sp. 3 qh. Carnow, Zenz, Hessl.

HO-452. Occupational and Environmental Diseases II. Will continue the discussion of occupationally related diseases. Diseases to be covered include the pneumoconioses, extrinsic allergic alveolitis, ionizing and nonionizing radiation, noise, vibration, heat, and cold stress. Prerequisites: nurse, physician, consent of instructor. W, Sp. 3 qh. Carnow, Zenz, Hessl.

HP-300. Introduction to International Health. Introduction to the history, philosophy, goals, achievements of international health. The various governments and agencies committed to international health. Problems of introducing change to communities, comprehensive health planning, health economics, training of health professionals around the world. Study of population dynamics and family planning programs in comparative international focus. Discussion of the commitments of the U.S. to programs of international health and population dynamics. Prerequisite: consent of instructor. F, W. 3 qh. Kamel and Staff.

HP-310. Current Concepts in Tropical Health. Major tropical health problems examined according to their current characteristics, causes, impact, and control. Also includes consideration of socioeconomic, cultural, and nutritional factors as they relate to health in the tropics. Prerequisites: enrollment in the School of Public Health or permission of instructor. F, W. 2 qh. Staff.

HP-320. History of Public Health. World history of evolution of health knowledge, practice, and programs from the times of Ancient Egypt, Greece and Alexandria, Rome, the Arab and European Middle Ages, and the Renaissance up to the present time. Specific contemporary world health problems are traced back to various stages of history and prediction is made of future world health trends in the light of lessons of history. Prerequisite: consent of instructor. F, Sp. 2 qh. Hennein.

HP-331. Family Studies for Health Professionals. Introduces cross-cultural studies of the family, focusing on application of theory and research findings to therapy and communication. Prerequisite: consent of instructor. F, Sp. 2 qh. Hennein.

HP-350. Introduction to Demography. Presents basic concepts of demography; sources and evaluation of demographic data; demographic descriptions of human population and changes over time; interrelationships among changes in structure, migration, and vital rates. Various uses of life tables in demographic analysis. Prerequisites: HB-300 or consent of instructor. W. 2 qh. P. Levy.

HP-361. Public Health Nutrition. Fundamentals of human nutrition and assessment of nutritional status of population groups. Nutritional problems of the industrialized countries, as well as developing areas of the world. Prerequisites: HP-300, a fundamental course in nutrition, biochemistry, or consent of instructor. F, W. 2 qh. Rader.

HP-410. International Health Studies. Studies of global patterns of health problems. Analyses of variations between nations and regions with respect to multiple causation of disease, critical review of comparative studies of specific health problems. Prerequisites: HP-300 or consent of instructor. Sp. 2 qh. Saxton.

HP-411. International Health Programs. A critical review of international health agencies and programs by individual analysis of (1) international health agencies: their development, organization, administration, and achievements, and (2) selected international health programs: their planning, implementation, effectiveness, and impact of populations served. Prerequisites: HP-300 or equivalent or consent of instructor. Sp. 2 qh. Kamel and Staff.

HP-420. Family Planning Programs. A critical review of various types of family planning programs, domestic and international, with attention directed to administrative, organizational, fiscal, and social aspects. Selected technical and administrative practices adopted by family planning agencies will be discussed. Prerequisites: HP-300, HP-331, HP-350 or consent of instructor. Su. 2 qh. Kamel and Staff.

HP-430. Family Planning: The Health Aspects. The biomedical aspects of human reproduction; contraceptive methods and devices, abortion, and sterilization, considered from a health perspective. Prerequisites: HP-300, HP-331, or consent of instructor. F, Su. 4 qh. Saxton.

HP-431. Family Planning: The Socio-Economic Aspects. A study of the social and economic determinants of population trends and family planning and the behavioral aspects of human sexuality in both advanced and developing communities. Prerequisites: HP-300, HP-331, HP-430, or consent of instructor. W. 4 qh. Hennein.

HP-450. Advanced Demographic Studies. In depth study of demographic problems, such as the construction and uses of multiple decrement life tables; evaluation of the quality of demographic data; estimation of the sizes and composition of various populations. Prerequisites: HP-350 or equivalent or consent of instructor. Sp. 2 qh. P. Levy.

HP-461. Advanced Public Health Nutrition. Study in depth of contemporary problems of human nutrition affecting communities in the U.S. and overseas, such as specific nutritional diseases, nutritional problems of special groups, food and nutrition policies and programs. Prerequisites: HP-361 or equivalent or consent of instructor. Sp. 4 qh. Ozerol.

RADIOLOGY

The graduate curriculum in radiology leads to the M.S. degree. Work in the field is provided to stimulate the development of critical investigators and knowledgeable teachers.

The M.D. or D.D.S. degree is a prerequisite except that students may be accepted on a selective basis if they are pursuing work toward the M.D. degree. The M.S. degree is not awarded before the requirements for the M.D. degree are completed.

Courses required of all candidates are RA-401, RA-402, RA-403, and at least 20 quarter hours in RA-493 and one seminar in a basic science each quarter for three quarters. The candidates who want to specialize in nuclear medicine are required to take RA-401, RA-402, RA-410, and at least 20 quarter hours of RA-494. Attendance is also required at departmental conferences and seminars.

Graduate students of the physical and biological sciences who are candidates for advanced degrees in these fields may register for all courses except RA-493.

Graduate Faculty

Professors: Vlastimil Capek, Seymour H. Yale.

Associate Professor: Dan Pavel.

Assistant Professors: Swaminathan Jayaraman, A. M. Zimmer.

RA-401. Radiation Physics for Medical Application. Weekly conferences on theory, mathematics, mechanics, production, detection, and protection from radiation sources; discussion on radiobiology; analysis of pertinent clinical and research problems. Intended for advanced graduate students using radiant energy. F. 2 qh. Jayaraman.

RA-402. Radiation Physics for Medical Application. Continuation of RA-401. W. 2 qh. Jayaraman.

RA-403. Radiation Physics for Medical Application. Continuation of RA-402. Sp. 2 qh. Jayaraman.

RA-410. Basic Radioisotope Methodology. Fundamentals of radioactivity are discussed in terms of simple theory, instrumentation, counting statistics, radiation safety, and biological effects of radiation. Depending on the applicant's interest, stress will be placed on experimental and/or clinical uses of radioisotopes. 1 qh. Zimmer, Pavel.

RA-493. Research in Radiology. Research in the physical and biological aspects of radiography and radiotherapy, using such instruments as monochromatic beams, isotopes, and the cobalt unit. F, W, Sp, Su. 1 to 16 qh. Capek.

RA-494. Research in Nuclear Medicine. Research in different aspects of nuclear medicine, including instrumentation, radiopharmaceutical, and clinical research. 1 to 16 qh. Pavel, Zimmer.

SURGERY

Graduate training in surgery leading to the M.S. degree is designed to introduce the surgeon to the formal aspects of research. In the process of completing the program, surgeons should acquire those skills and mental habits necessary to plan and implement research, utilizing sophisticated methodology. Subsequently they should be able critically to assess research progress. Our goal is to prepare a surgeon for a career as a research physician if that is desired. Thus, the candidate must devote the major portion of his or her time to research; it is expected that the choice of research will reflect the basic science components of surgery and medicine. Since cognizance of both the clinical and scientific phases of preoperative and postoperative care as well as surgical convalescence cannot be achieved by pursuit of the basic sciences alone there will also be exposure to the art of surgical techniques; however, the time so devoted shall not apply toward credit in the Graduate College.

The M.D. degree is required for admission although medical students who have completed one year of the medical curriculum may apply. Such candidates are not granted a graduate degree until they have completed requirements for the M.D. degree.

The formal graduate course requirements are met by taking the courses offered in the basic sciences which support the student's research interests. Attendance at surgical-pathology conferences, journal club and Grand Rounds is required.

Graduate Faculty

Professors: C. Thomas Bombeck, Samuel S. Clark, Tapas K. Das Gupta, William J. Grove, Olga Jonasson, Sidney Levitsky, Gerald S. Moss, Lloyd M. Nyhus, Bernard Sigel, Paul A. Thomas.

SU-491. Seminar. Discussion of research problems, review of pertinent literature, presentations of research in progress. Discussion of recent advances in research by staff and visiting scientists. F, W, Sp, Su. 3 qh. Staff.

SU-493. Research in Surgery. Research investigations of problems in surgery, exclusive of technique. F, W, Sp, Su. 1 to 16 qh. Staff.

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May 4 (Friday)	Last day for Graduate College approval of thesis format for spring quarter
May 11 (Friday)	Last day for deposit with Graduate College of approved theses for spring quarter, and for addition of names to spring quarter graduation list
May 30 (Wednesday)	Memorial Day — holiday (no classes)
June 1 (Friday)	Commencement
June 4-8 (Monday-Friday)	Examination period
June 9 (Saturday)	Quarter ends

Summer Quarter 1979

June 12-13 (Tuesday-Wednesday)	Registration for summer quarter
June 15 (Friday)	Last day for completion of degree requirements without further registration
June 18 (Monday)	Instruction begins
June 29 (Friday)	Last day for late registration
July 4 (Wednesday)	Independence Day — holiday (no classes)
July 20 (Friday)	Last day to withdraw from a course, change program, or change registration from audit to credit
July 30 (Monday)	Last day for fall quarter admissions applications
August 3 (Friday)	Last day for Graduate College approval of thesis format for summer quarter
August 10 (Friday)	Last day for deposit with Graduate College of approved theses for summer quarter, and for addition of names to summer quarter graduation list
August 27-31 (Monday-Friday)	Examination period
September 1 (Saturday)	Quarter ends; degrees conferred

Fall Quarter 1979

September 11-13 (Tuesday-Thursday)	Registration for fall quarter
September 14 (Friday)	Last day for completion of degree requirements without further registration
September 17 (Monday)	Instruction begins
September 28 (Friday)	Last day for late registration
October 8 (Monday)	Columbus Day — holiday (no classes)
October 15 (Monday)	Last day for winter quarter admissions applications
October 26 (Friday)	Last day to withdraw from a course, change program, or change registration from audit to credit
November 2 (Friday)	Last day for Graduate College approval of thesis format for fall quarter
November 9 (Friday)	Last day for deposit with Graduate College of approved theses for fall quarter, and for addition of names to fall quarter graduation list
November 22-23 (Thursday-Friday)	Thanksgiving holiday (no classes)
November 26-30 (Monday-Friday)	Examination period
December 1 (Saturday)	Quarter ends; degrees conferred

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